SUMMER MEETING OF HEATING ENGINEERS

THE HEATING AND VENTILATING MAGAZINE

VOL. VI., No. 8 NEW YORK, AUGUST, 1909 $1.00 a year, 10 cents a copy

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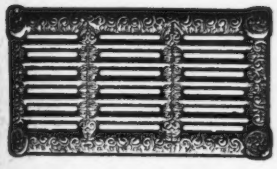

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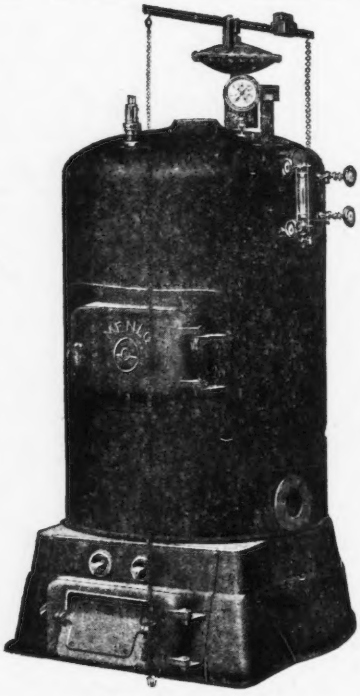

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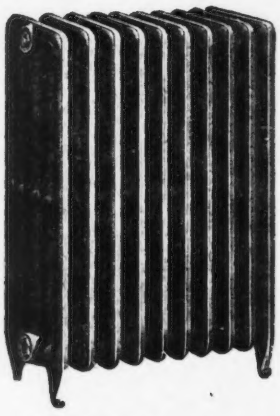

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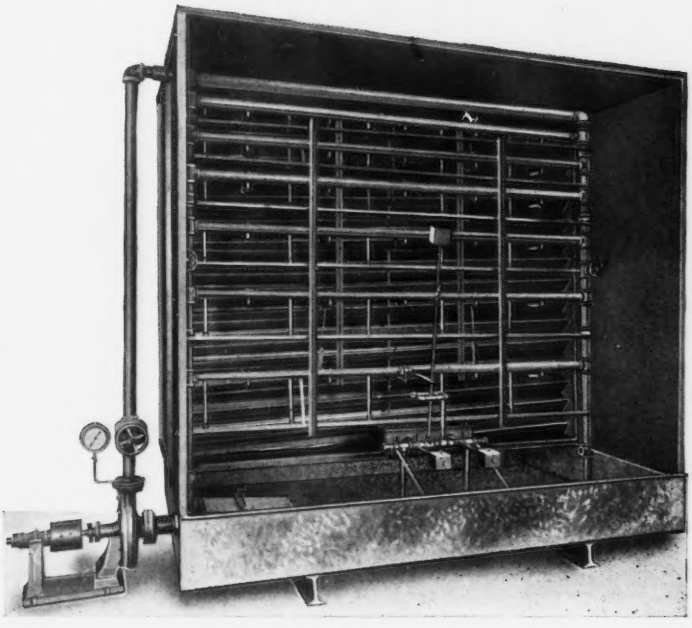

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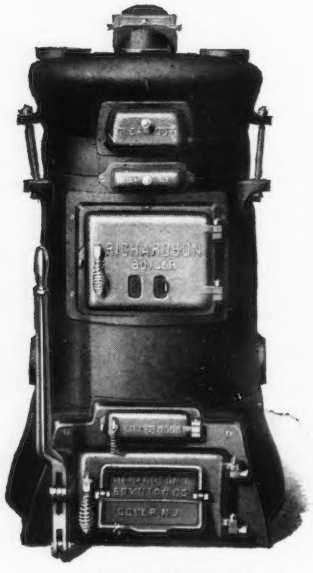
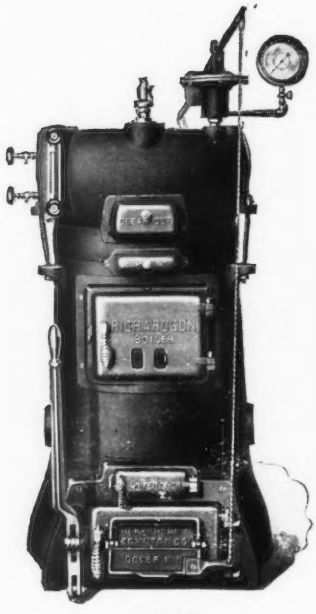


HOT WATER



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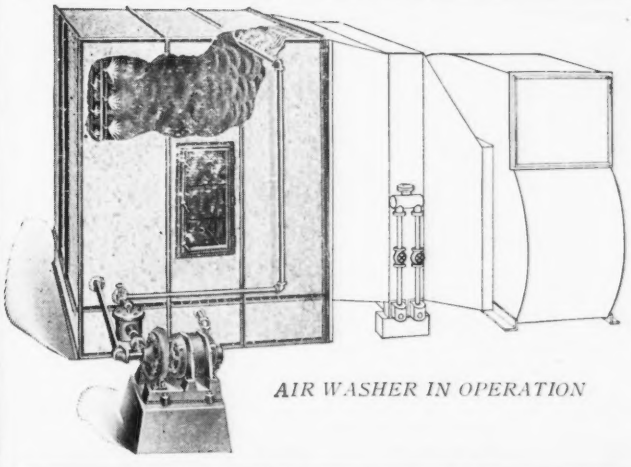

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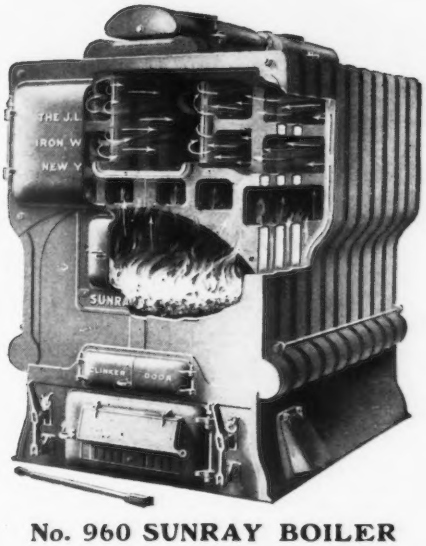

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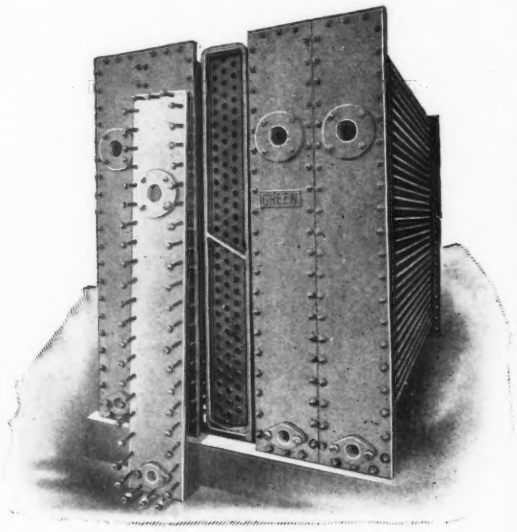
HAVE you ever noticed the design of steam air heaters? Did you observe that in most of them the steam does not circulate positively; in other words, the steam could pass directly from the inlet to the outlet, and that the pipes are joined in loops that make nice air pockets, so that the air can collect and keep out the steam?



The Green Steam Air Heater has positive circulation, the current must flow straight ahead through half the tubes and back through the other half. The flow of the steam is in the same direction as the drainage of condensation; therefore there will be no water hammer, and all air is carried along by the steam. As there can be no clogging by air, all the surface is active in transmitting heat.

This heater can be used as well for hot and cold water or cold brine or with steam. If oily steam or dirty water is used, every tube can be inspected and cleaned by removing the cover plates, and, if by accident any tube should be damaged, it can be removed or plugged with equal facility.

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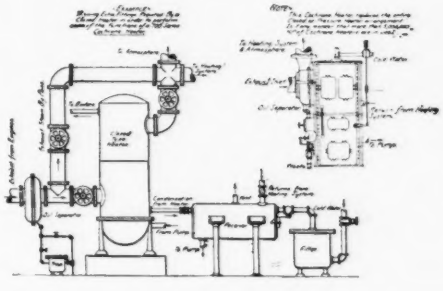
185

WHAT A COMPLETE EXHAUST STEAM HEATING OR DRYING SYSTEM SHOULD INCLUDE

1st, an oil separator to remove all grease and engine cylinder lubricant from the steam, which otherwise would foul the heating system and render the returns unfit for boiler feed purposes.

2d, a trap to drain this separator.

3d, a feed water heater, since the most valuable application of exhaust steam is heating the boiler feed up to the boiling point, and next the furnishing of a supply of hot water for industrial purposes.



4th, a receiver or hot well for the returns coming back from the heating system.

5th, a raw water regulator to supplement these returns as required to make up the full amount of boiler feed, and

6th, in many cases, some kind of a purifier and filter to render this make-up water non-scaling and non-corrosive in the boilers.

The left hand part of the drawing shows some of these appliances, together with the valves, elbows, piping and other fittings that would be required for their installation.

But why install all these separate pieces of apparatus, and why waste all the space that they will require, when their functions can be combined in one compact, self-contained apparatus, viz., the new **Cochrane Surplus-Exhaust Feed Water Heater and Receiver** shown at the right in the drawing? This Cochrane Heater is equipped with a separator not only large enough to purify the steam condensed in the heater in heating the feed water up to 210° F., but also of sufficient capacity to purify all the surplus exhaust steam passing to the heating system or to atmosphere. Valves are so arranged that both separator and trap can be cut off from the body of the heater for inspection or cleaning, while the heating system is in operation

If you will submit some actual case to us we would be glad to make up a special print showing how this heater simplifies and improves the piping arrangements. Let us send you a copy of our new Exhaust Steam Heating Encyclopaedia, No. "4—E."

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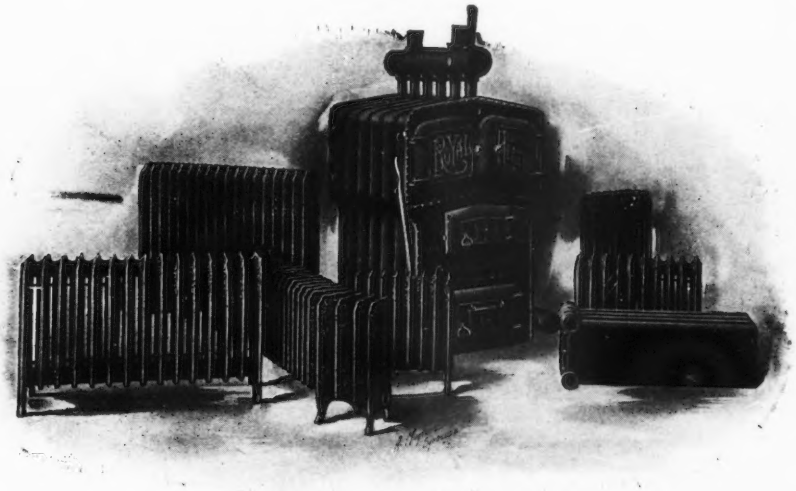

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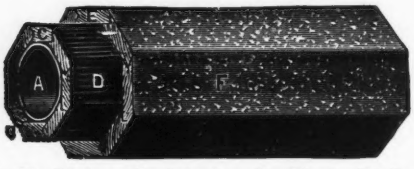

A—Tin Lining. B—Asbestos. C—Wood. D—Corrugated Paper. E—Wood. F—Asphaltum Coating.

(B) It is waterproof.

(C) It is easily put on and easily removed. (D) Experience shows that it saves more steam than any other covering.

It Is Time to Order Now for the Season
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The Heating and Ventilating Magazine

VOL. VI No. 8

Contents for August, 1909

American Society of Heating and Ventilating Engineers 1
Proceedings of Summer Meeting
Fan Blast Heating Practice - - - - - - 3
Proposed Plan for Rating House-Heating Boilers - - 6
Illincis's New Factory Ventilation Law - - - - 8
An Investigation of Air Washing - - - - - 9
Safeguarding Our Profession - - *W. M. Mackay* 11
A Combination Ventilating, Heating and Cooling Plant
A. M. Feldman 14
A New Rapid Circulation Hot Water Heating System - 27
Improving Heat Transmission in Waste Heat Air Heaters 31
Current Trade Literature - - - - - - 33
The Weather for June, 1909 - - - - - 34
New York, Boston, Pittsburg, Chicago and St. Louis
Influence of Exercise on the Vitiation of Air - - 34
Trade and Miscellaneous Notes - - - - - xi

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK AUGUST, 1909

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Semi-Annual (Midsummer) Meeting, Indianapolis, July 15-16, 1909

With a number of important projects before it, the midsummer meeting of the American Society of Heating and Ventilating Engineers, at Indianapolis, July 15-16, was one that could not fail to attract the interest of its members. In addition to the papers presented, the important subjects of boiler ratings, air washing and factory ventilation were discussed in special reports, showing the society's committees to be in a healthy state of activity as well as offering much food for thought and work on the part of the members generally.

Overshadowing in interest the other matters discussed was the preliminary report of the committee on cast iron boiler ratings. The prospect that the committee will have this matter in shape for final action at the next meeting of the society was realized to be of the deepest significance as establishing a comparatively early date when the proposed new method of rating boilers will go into effect. With the acquiescence of the boiler manufacturers in the general plan already secured, the propects seem bright for the success of the movement which will reflect so much credit on all concerned.

The first session was called to order by the President William G. Snow, of Boston, in the Palm Room of the Claypool Hotel, Thursday morning, July 15. The roll call was read, the register showing the following members present at this or subsequent sessions:

William G. Snow, Boston.
Aug. Kehm, Chicago.
W. M. Mackay, New York.
R. C. Carpenter, Ithaca, N. Y.
James Mackay, Chicago.
John R. Allen, Ann Arbor, Mich.
J. D. Hoffman, Lafayette, Ind.
John F. Hale, Chicago.
A. M. Feldman, New York.
Francis M. McQuire, Rockford, Ill.
Frank K. Chew, New York.
Theodore Weinshank, Indianapolis.
W. W. Macon, New York.
W. H. Johnson, Indianapolis.
William G. Braemer, Camden, N. J.
W. C. Wolf, Elkhart, Ind.
A. W. Kerr, Chicago.
T. E. Keegan, Indianapolis.
A. H. Weinland, Indianapolis.
W. H. Conrad, Indianapolis.
E. A. May, Chicago.
Sam. Kauffman, St. Louis.
James A. Donnelly, New York.
B. Natkin, Chicago.
S. E. Fernsternmaker, Indianapolis
A. M. Stackhouse, Chicago.
George D. Hoffman, Chicago.
A. G. Cripps, Akron, O.
James L. Sparks, St. Louis.
Andrew Harvey, Detroit, Mich.

Joseph Graham, New York.
William Grier, Pittsburg.
A. S. Armagnac, New York.
J. F. Harmon, Marion, Ind.
Thomas Tait, Washington, Ind.
Joseph G. Hayes, Indianapolis.
John Boylston, Chicago.
S. Morgan Bushnell, Chicago.
B. F. Baker, Lafayette, Ind.
Jas. H. Davis, Chicago.
L. W. Straw, Danville, Ill.
E. J. Ryan, Danville, Ill.
H. W. Whitten, Detroit, Mich.
Wm. A. Short, Decatur, Ill.
F. B. Gaelting, New York.
A. E. Werkhoff, Lafayette, Ind.
John Zellweger, St. Louis.
A. F. Sheahan, St. Louis.
Charles F. McCarthy, Indianapolis.
Fred B. Hoft, Indianapolis.
J. A. Moyer, Ann Arbor, Mich.
M. J. Farquhar, Wilmington, O.
Percival H. Seward, New York.
J. H. Kinealy, St. Louis.
T. H. Denison, Chicago.
L. K. Ascher, Indianapolis.
H. J. Wocher, Indianapolis.
J. H. Bacon, Jr., Cleveland.
W. A. Baker, Toledo.
Wm. F. Schardein, Louisville, Ky.
J. W. Hurty, Indianapolis.
R. C. Turner, Indianapolis.
J. P. Brown, Indianapolis.
H. L. Dillon, Chicago.
A. T. Kellogg, Kewanee, Ill.
George F. Kirkhoff, Indianapolis.
J. M. Gilchrist, Indianapolis.
O. P. Benjamin, Detroit.
George W. Wood, Cleveland.
Frank P. Phegley, St. Louis.
J. H. Brewster, Indianapolis.
R. E. Haldeman, Indianapolis.

LADIES

Mrs. Francis W. McQuire, Rockford, Ill.
Miss Winifred Kinealy, St. Louis.
Mrs. Theodore Weinshank, Indianapolis.
Miss Anna Weinshank, Indianapolis.
Mrs. H. W. Whitten, Detroit.

A committee was appointed to welcome members, consisting of Prof. J. D. Hoffman, Theodore Weinshank, W. H. Johnson and John A. Hale. President Snow then read his address, in which he said:

President's Address

A striking degree of interest in this organization has been manifested of late. On our recent ballot, the largest in our history, 27 new members, 2 juniors and 5 associates were elected.

One feature that augurs well for our future success is the willingness of many of our members to give freely of their time to important committee work. This is a real sacrifice made by a few for the benefit of all.

We have always given freely through the engineering and trade press of the fruit of our meetings for the benefit of the public. Occasionally the courtesies we have extended have been misused. It is not expected that reports of our meetings shall be as complete or as accurate as the contents of our proceedings. Inaccurate reports reflect anything but credit on our society.

The value of this society to its members is to be measured not only by what they can extract from it, but by what the members can contribute to it by papers or discussions as well.

Carefully prepared papers are a valuable training to the contributors of such papers. I hope that our younger members will appreciate this and will bear in mind that it is time that some of our older members who have done so much for us in the past be relieved of some of their responsibility for the success of our meetings.

This society stands for the engineering side of heating and ventilation. To be successful it must be kept free from commercialism. We have our trade organizations. Let it be emphasized then that this society is purely for engineering. Let the members come here with a serious purpose to advance its interests so that our standards will be the recognized ones and our aims will command public support.

Our society is rapidly gaining in size and I believe in the quality of its membership. Let our aims be high and let us not forget our duty to the public. Every year, as we all know, immense sums are wasted through faulty installations due to no desire on the part of the contractor to take advantage of the ignorance of his customer, but due to lack of knowledge of some of the principles of heating and ventilation.

Standards are needed for the protection of the layman and for the guidance of the contractor. Our committees are at work on such standards and their adoption, when perfected, will add to the usefulness and prestige of our society.

Not only are standards needed to secure successful installations, so far as accomplishing the desired ends as to heating and ventilation, but with higher fuel costs greater attention must be paid to economical operation, to a better understanding of the relative advantages of different systems and to securing on the part of purchasers a better appreciation of the fact that there may be other items more important than the first cost which should determine the selection of a heating and ventilating apparatus.

This society has done much valuable work in securing compulsory legislation; much more work of this character is needed. The sufferers in our workshops are not in a position to take the initiative in ameliorating their condition. We owe it to them to do all in our power to see

to it that the conditions under which they must work are made sanitary.

At this time, when the public is being educated to the fact that fresh air and plenty of it is not only a preventive but a cure for certain diseases, we must do all we can to assist in this work. We have a publicity committee which I believe has a broad field of usefulness before it. It will be the function of this committee to arrange for the dissemination of knowledge pertaining to ventilation. Assistance will be needed from members scattered throughout the country and I commend its work to you and bespeak for this committee your cordial coöperation.

It is with deep regret that I mention the death since our Annual Meeting of a former vice-president and charter member, Mr. T. J. Waters, of Chicago, one whose work reflected credit on this society and who did much to advance its interests. One of our past presidents, Mr. John Gormly, has found it necessary, on account of ill health, to retire from business and has resigned from this society. It was with regret that his resignation was accepted.

Our constitution is not mandatory in regard to our summer meetings, but they have been so enjoyable and have served to promote good fellowship to such an extent that doubtless they may be considered a permanent feature in the conduct of the society. While good fellowship abounds at all our meetings this should be particularly true of those held in the summer when nature is at her best and beckons us to drop for a time the cares and responsibilities that are a part of the existence of most of us.

Here is this beautiful city, let us give the necessary attention to the serious part of our meetings, but let it be an occasion when members will get in close touch with each other, when East meets West and North meets South, and that, as a result, we shall all be in full sympathy with each other and with the objects of this society as set forth in its constitution and shall be ready one and all to coöperate to secure the attainment of those objects and to build up the prestige of this organization.

John A. Hale reported for the Illinois Chapter that the present membership is 30. Meetings have been held regularly each month and good fellowship is prominent in the chapter gatherings.

The report of the committee to collect data on fan blast heating was read by Prof. R. C. Carpenter and is presented herewith.

Fan Blast Heating Practice

This final report* of your committee concludes those presented at the January meetings in 1908 and 1909.

Replies to the questions in the 1908 report have been received from one other manufacturer as follows:

Q. 1. Please send elevations, sections, etc., showing clearly the construction of your standard heater sections.

A. 1. Illustrations were sent.

Q. 2. What size and kind of pipe do you use?

A. 2. 1-in. steel.

Q. 3. What size and kind of fittings do you use?

A. 3. 1-in. cast iron.

Q. 4. What distance do you space your pipes between centres across the face of the heater, also the direction the air flows?

A. 4. 2¾ in.

Q. 5. How are sections connected together; by manifolds, headers or flanges, and where or when do you use the several methods?

A. 5. With cast-iron manifolds, wrought nipples and flanges. We use this manifold on factory work only; for public building work, the connections are always made by steam-heating contractor.

Q. 6. What depth do you advocate making the coils in rows of pipe, for (1) outside air, (2) return air for c, d, e, f?

(a) Live steam, heating public buildings?

(b) Exhaust steam, heating public buildings?

(c) Live steam, heating factories?

(d) Exhaust steam, heating factories?

(e) Live steam for dry kilns?

(f) Exhaust steam for dry kilns?

A. 6. (a) We believe it very uneconomical to use live steam for heat-

*Final report of Committee on Fan Blast Heating, read before The American Society of Heating and Ventilating Engineers, at Indianapolis, July 15, 1909.

ing purposes for public buildings, or to ever use anything but fresh air. Whenever our advice is asked, and where there is not enough exhaust steam available, we should use a pressure-reducing valve.

(b) 20 rows.

(c) 20 to 24 rows.

(d) Never less than 24 rows. If fresh air is used, sometimes 28 rows.

staves either for slack or tight barrels or cottonwood staves, the blower system is the only system to be used. The heater should be at least 24 rows deep for live steam or 32 rows deep for exhaust steam.

Q. 7. What is the ratio of free area between the pipes to the "over-all area" of a section?

A. Roughly, about 50%.

Q. 8. What is the maximum allowable velocity of air through a heater section as determined by you:

(a) For public buildings?

(b) For factory buildings?

(c) For dry kilns?

LOW PRESSURE 5 POUNDS

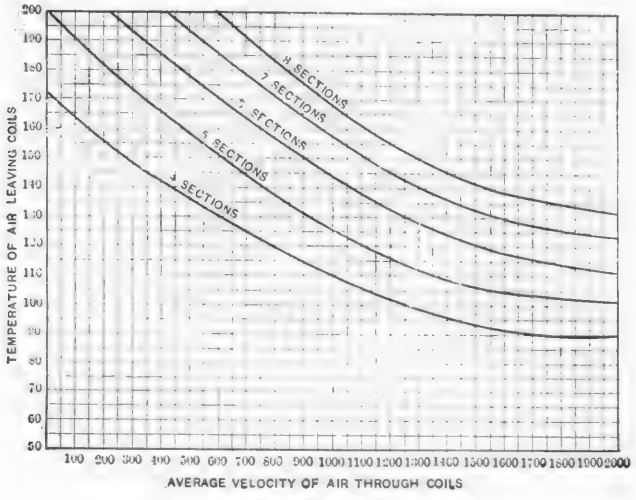

CHART A

LIVE STEAM 80 POUNDS

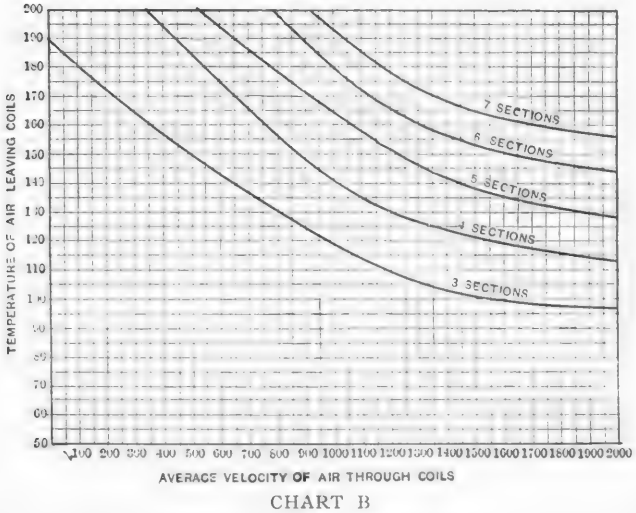

CHART B

(e) We do not believe that blowers should ever be used for drying the ordinary grades of lumber. For certain special classes of lumber such as soft maple broom handles, gum barre

A. 8. (a) 1,000 ft.
(b) 1,500 ft.
(c) 1,500 ft.

Q. 9. What temperature do you consider the air should be heated to, to give best results with a tempering coil?

A. 60°.

Q. 10. How many rows of pipe do you allow for:

(a) Tempering coil?

(b) Heater coil?

A. 10 (a) From 4 to 8, depending upon space conditions.

(b) From 8 to 12.

Q. 11. Do you advocate blowing through or "drawing" through a heater? Where and why?

A. 11. For most public building work, we advocate blowing through, because it is usually easier to arrange for by-passing the air for tempering purposes. On public building work, we use a "draw-through" heater only when space conditions make it necessary. On factory work, we use a "draw-through" heater almost entirely because of space conditions.

Q. 12. How do you determine the maximum temperature obtainable with varying depths of heaters, velocities and steam pressures?

A. 12. From temperature and velocity charts A and B, showing final temperature of air leaving heater made up of sections having 4 rows of 1-in. pipe each, spaced 2¾ in. on centres, temperature of entering air 0° F.

Q. 13. How do you determine the heat units given off per square foot of heating surface per hour with varying initial temperatures and velocities of air, and steam pressures; also the condensation under same conditions?

A. 13. The relative condensation in heater sections of 4 rows of 1-in. pipe each, spaced 2¾ in. on centres, entering air 0° F., average air velocity between pipes 800 ft. per min. is:

1 4-row section	1.48
2 4-row sections	1.37
3 4-row sections	1.25
4 4-row sections	1.175
5 4-row sections	1.08
6 4-row sections	1.00
7 4-row sections	0.95
8 4-row sections	0.85

Q. 14. What has been your experience with cast-iron pipe or other indirect radiation besides pipe coils?

(a) Has it been as effective as a heating medium?

(b) What is the comparative efficiency?

A. 14. As we are manufacturers of pipe coils and not of cast-iron radiators, our answer to this question would necessarily be biased and, hence, not given.

Q. 15. What type of radiation do you recommend for hot-water heating?

A. 15. A mitre section [having vertical supply header and horizontal return header]. We recommend the same type of section for either gravity circulation, or for forced circulation by pump, but we would not advocate a gravity hot-water system for blower work.

Q. 16. How do you compute the size of steam mains and returns for heaters supplied with steam at varying pressures? Also for hot-water circulation?

A. 16. Have no good rules for this.

Q. 17. Do you regularly make provision for the removal of air from the radiation? If so, where and under what conditions of operation?

A. 17. With our standard heater we get very good results without any special provision for removing the air from coil.

Q. 18. Do you consider air valves either a necessary adjunct or a means of increasing the efficiency of the type of radiation you make?

A. 18. We do not.

Q. 19. Do you make any addition to or deduction from the amount of radiation, as commonly determined by the rules or formulæ you employ, if any one of the several "vacuum systems" is attached to the heater?

A. 19. We make neither addition nor deduction from the amount of radiation as commonly determined by our method of figuring if any one of the several "vacuum systems" is attached to our heaters.

While illustrations of various types

of heaters might perhaps have been included to advantage in this report, it has not seemed necessary to do so, since these may be had for the asking from the several manufacturers.

Although as many replies were not received as your committee had hoped for, it is believed that the data secured will enable the Committee on Standards (to which these data are to be referred) to arrive at some conclusions which will be of value to the society.

WM. G. SNOW, *Chairman*,
R. C. CARPENTER,
J. H. KINEALY,
F. R. STILL.

Committee on Fan-blast Heating.

The report also included an appendix, consisting of a discussion, with tables, of the committee's previous report, contributed by Perry West, of Newark, N. J., in which he gave a rational formula covering the performance of indirect heaters (published in THE HEATING AND VENTILATING MAGAZINE for March, 1909.)

DISCUSSION.

Mr. Hale said that in his experience air valves are a necessary adjunct for fan blast radiation.

Mr. Donnelly said that the statement in the report that no air valves were used made it difficult to understand how the varying condensation figures were obtained, as given in the table.

Mr. Davis, referring to Answer 6 (a) regarding the economy of heating by fresh air, said probably the largest heating installation in the country is in the Terminal Buildings in New York, which is a hot water heating system.

On motion of Mr. Macon, the report was referred to the committee on Standards.

The report of the committee on standards relative to boiler rating was read by the chairman, Prof. J. H. Kinealy. The report, he said, had the approval of all but two of the committee, one of whom did not send his vote and the other dissented. The report is given herewith.

The Proposed Basis for Rating House-Heating Boilers

Your committee on standards with your committee on boilers, forming a joint committee, have worked hard since the January meeting of the society upon the subject of rating cast iron boilers, which was assigned to us at the January meeting.

We are not prepared at present to submit a final report, because we have not yet completed our work. This report is only a report of progress in which we desire to tell you what we have done and to ask you to bear with us until the next meeting when we hope to have our work completed and to be able to submit to you a final report embodying a standard rating for cast iron boilers. We have arrived at a scheme about as follows:

A BOARD OF APPEALS PROPOSED

We will establish a standard rating based, in accordance with the instructions given to us by the society at its meeting in January, 1909, upon the rate of combustion per square foot of grate surface and the efficiency; and in order that those manufacturers who consider that their boilers should be rated higher than the standard rating may have an opportunity to prove their claims, we are considering recommending that there be established a Board of Appeals to whom manufacturers may submit evidence in regard to their boilers and ask for a higher rating.

Our idea is that whenever this Board of Appeals considers that a boiler is entitled to a rating higher than the standard rating, it will so certify and thus give to this particular boiler whatever rating above the standard rating the board may consider proper.

PRINCIPAL POINTS AGREED UPON

In considering what shall be the standard rating of boilers of different sizes we have agreed:

1. That standard coal shall be anthracite coal having a heating power of 13,000 B. T. U. per pound of dry coal.

2. That 1 sq. ft of direct radiating steam surface, with steam at 2 lbs. pressure in the radiator and a temperature of 70° for the surrounding air, will emit 250 B. T. U. per hour; and that 1 sq. ft. of direct radiating hot water surface, with water at an average temperature in the radiator of 160° and a temperature of 70° for the surrounding air, will emit 150 B. T. U. per hour.

3. That the grate area of a boiler shall be the opening in which the grate is placed, measured to the outermost limits of air openings.

4. That the standard ratings shall be for boilers under average working conditions.

We have not yet worked out in detail the method whereby the Board of Appeals shall be appointed nor the number of members to serve on the board. We have had a meeting with the members of the Boiler Manufacturers' Association and they have consented to give the matter of rating boilers their careful consideration, and we expect to hear further from them in the Fall.

We have had the question of boiler ratings under consideration with a committee appointed by the National Association of Master Steam and Hot Water Fitters and this committee has agreed to coöperate with us and to give us the benefit of their experience.

On the whole, your committee is able to report that a great deal of progress has been made and that the question of rating boilers is in a very satisfactory condition and, we think, will have been thoroughly threshed out to a final conclusion by the time of the annual meeting of the society next January.

DISCUSSION.

Mr. Davis asked what were average working conditions for a house heating boiler.

Prof. Kinealy said the committee had not got down to these details. All that the members of the committee were asked to tabulate were the amount of coal to be burned per hour, the efficiency of the boiler and the number of square feet of steam and hot water radiation it would carry, the last being calculated from the amount of coal and the efficiency.

MR. MAY: Is the standard fuel to be air dried or oven dried? How can this be arranged in commercial practice?

PROF. CARPENTER: I do not think we need to consider the conditions under which efficiency of coal is obtained. A test made by a chemist will show conditions under which heat exists.

MR. DONNELLY: The question seems to be whether the boiler is to be applied to the rating or the rating to the boiler. It would seem to me the proper way to do is to establish a standard rating and then bring the boiler to the rating which would entitle it to a stamp of merit. A different standard would probably have to be established where boilers were used for heating greenhouses.

MR. JAMES MACKAY: The efficiency of the coal as given in this report appears to me to be a little high, while the rate of transmission from the radiators seems a little too low.

PROF. KINEALY: Those matters were decided by a vote of the committee, the figures before you being the average of those given in the votes.

MR. SEWARD: As I was one of the members of the committee who voted against the approval of this report, I would like to say that I did so on the ground that I interpreted the resolution on the subject passed at the society's last meeting as indicating a method of rating boilers rather than a rating.

PROF. CARPENTER: I believe with Mr. Seward that the efficiency of the boiler should not be an assumed efficiency but an actual efficiency.

MR. MACON: Would the proposed standard be published in boiler catalogues?

PROF. KINEALY: It will be much

the same as the effect on power boilers and engines of the standard adopted by the American Society of Mechanical Engineers, 30 lbs. of steam per hour equalling 1 H. P.

MR. FELDMAN: The rating as effected by heat transmission from radiators would depend on the size of pipe connections and whether it was covered.

Afternoon Session, July 15

Before the regular order was proceeded with, a report of the committee on the New York State factory ventilation law, presented through Burt S. Harrison, chairman, was read by Frank K. Chew.

Illinois's New Factory Ventilation Law

Since the last annual meeting of this society there has been little progress in the efforts to prevent the repeal of Section 86 of the Factory Laws regarding the ventilation of loft buildings used for factory purposes. A letter was framed and sent to Governor Hughes, to the president of the State Senate and to the speaker of the Assembly. It is proposed to send circular letters to the members of the society, urging them to take up the matter with their State senators and assemblymen. It is hoped that at the next annual meeting we may have something definite to report.

In the meantime, it may be of interest to note that in the State of Illinois, Senate Bill No. 385 has been enacted and became a law July 1, 1909. Section 2 of this law reads as follows:

"Sec. 2. In every factory, mercantile establishment, mill or workshop, where one or more persons are employed, adequate means shall be taken for securing and maintaining a reasonable and, as far as possible, equable temperature consistent with the requirements of the manufacturing process. No unnecessary humidity which would jeopardize the health of employees shall be permitted."

This is as complete a bill, we believe, as has been passed by any of the States, so far. The last sentence in Clause 2, "no unnecessary humidity which would jeopardize the health of employees shall be permitted" certainly means dehumidification under some circumstances, but leaves open the question of the limits within which humidity does jeopardize the health, and the burden of proof would seem to rest on the factory inspector. There is no doubt that in factories similar to paper mills, where the cooling by contact of the humid air with outside walls and roofs results in precipitation which damages the product of the mill, there should be little difficulty in enforcing the law, since its enforcement is to the benefit of the output of the mill. However, where the output of the mill or factory is of a nature not effected by humidity or moisture, this might not be true.

In England, where the climate is naturally very humid at times, it was found necessary to pass laws limiting the allowable humidity in cotton mills, since the mill owners were prone to carry it to as high a point as possible to facilitate the weaving of the cotton cloth.

Since it is a fact that the effect of humidity on the vital forces of the human body varies with the temperature of the air, it would seem that some definite relation of relative humidity limits to temperature should be established, and there appears to be some need for the society to obtain what data is available along this line.

Mr. H. W. Whitten called attention to a new law passed in Massachusetts, entitled, "Sanitary Provisions for Public Buildings and Schoolhouses." It is known as Senate bill No. 340 and House bill No. 1245. Section 116, which he quoted, reads as follows:

"Every public building and every schoolhouse shall be kept clean and free from effluvia arising from any drain, privy or nuisance, shall be provided with a sufficient number of proper water closets or privies and shall be ventilated in such a manner that the air shall not become so impure as to become injurious to health. If it appears to an inspector of factories and public buildings that further or different sanitary, ventilating or heating provisions are required in any public building or school house, in order to conform to the requirements of this section and that such requirements can be provided without unreasonable expense, he may issue a written order to the proper person or authority directing such sanitary, ventilating or heating provisions to be provided." (A fine of $100 is the penalty for noncompliance.)

A report of the committee to collect data on air washers, Samuel C. Lewis, chairman, was read by W. W. Macon. It is presented herewith.

An Investigation of Air Washing*

It is admitted that the purification of air is vital and that the engineering connected therewith is most important and interesting. Ever since there have been any attempts made to ventilate buildings efforts have also been made to remove the impurities from the air admitted. With the congestion of population in cities, and the burning of bituminous coal it has become even more important to cleanse the air.

With the wide use of fans for ventilation and the accompanying high air inlet velocities large quantities of dust and soot are pulled in and given no opportunity to settle until they reach the ventilated apartments. Almost every conceivable type of apparatus for removing the dirt has been tried. It is highly desirable also to purify the air, removing objectionable gases and odors. Dry filters of wire and cloth are in use. To be permanently effective they must be cleaned continuously or they merely hold up the impurities so that they contaminate more air, and very soon become so clogged that the free area is curtailed.

Cheese cloth bags in the air inlets to gravity indirect plants in residence sections of cities even, will become black and practically inoperative in twenty-four hours. Therefore, there is little to be hoped for from them when used with mechanical ventilation in business or manufacturing districts.

Often, in designing dry air cleaners, the engineer has apparently forgotten that the delivery of large volumes of air was the original purpose of the plant, and has provided cloth filters of such thickness that practically no air could get through, resulting in their abandonment.

The dry cleaners do not remove odors. However, if designed with ample free area, and changed every few hours, they are very effective in removing dirt and soot.

The bag type seems to be the most efficient and the bags should be made of inexpensive material and burned. In England, air is filtered through cotton fibre held between screens. These are open to the objections inherent to all dry cleaners.

TYPES OF AIR WASHERS USING WATER

There have been many types of air cleaners which use water. When water is used over a screen of sufficiently fine mesh for the screen to be effective, the water closes the interstices in the screen and reduces the free area. Coke is used, being held in trays of wire, with water running over the whole. The pores of the coke soon become clogged, and the whole mass gets slimy and unspeakably foul, when it is a tedious and expensive task to remove it and refill the trays with new material. This type of cleaner also produces considerable resistance to the flow of the air.

Various other expedients have been tried, such as ropes of fibre running as endless belts through a pan of water, the air being drawn between the dripping ropes. With such types there is apparently not enough impinging area, and, like the coke type, the maintenance cost is high.

Gradually there has developed a type of cleaner in which the air is first drawn through a chamber in which it meets with a spray of water, then between a battery of metal plates which are so arranged that little, if any, of the water can be drawn through.

Many of the processes and devices of this type of cleaner are covered by patents and the description and data connected therewith must be approached with caution and handled with care by a committee of an engineering society.

Apparently, some of the devices operate on the theory that mist will so dampen and cohere the dust and impurities that they will fall into the water pan provided at the bottom of the spray chamber. Others believe that rain, not mist, is the necessary agent. Others believe that neither rain nor mist will accomplish the desired result, but that dust and soot in the air and drops of water, traveling

*Preliminary Report of the Committee on Air Washers, American Society of Heating and Ventilating Engineers.

together at a high velocity, then slapped, as it were, against a flat, wet surface, will be deposited there and washed away. Soot is greasy and water does not have an affinity for it.

PRESENT METHODS OF CONSTRUCTION SUCCESSFUL

All of these types, we believe, use the batteries of metal plates, and, to a large extent, we believe the principle that makes one effective makes all more or less effective.

The baffles may be vertical or horizontal, curved, angled or hooked. These washers must nearly all have circulating pumps, as the large quantities of water used would be expensive if handled but once.

If the cleanser is effective or if there is enough dirt in the air to make it worth while to run the cleaner, this water must be frequently renewed. The cost of running the circulating pump is generally nominal.

It is beyond question that when handled intelligently, properly cleaned and cared for, the type of air cleaner just described does clean nearly all of the dust and soot from the air.

It is desirable to often change the amount of moisture in air, also to cool it and to eliminate odors.

There have been many instances of the water type of air cleaner having added too much moisture. More recently, owing to a better understanding of the principles, this question of moisture control is being solved.

The relations of humidity and temperature are intimate and a very close degree of regulation is imperative. This is obtained by the automatic control of the relation between the temperature of the air and the water. The air and the water are both cooled naturally by evaporation, and especially when cool water is available it is possible to reduce considerably the temperature of the air admitted to a building without decreasing its ability to evaporate the perspiration of the occupants. To a considerable extent, the spray water may be caused to absorb odors from the air, and several devices of the water spray type are now being operated for this purpose.

The committee has been invited by nearly all of the air washer manufacturers to make tests at their factories. One manufacturer offered, if the others would join him, to erect a special apparatus at his own expense for competitive tests.

We have made some tests, have copies of many made by others, and will make more tests ourselves. These are, we fear, of little value, because we cannot make public the manufacturers' names. We append a few notes to show what air washers are accomplishing, hoping to draw forth discussion.

TESTS SHOWING EFFECT OF AIR WASHERS IN COOLING AIR

Following are the results of a test made by a government engineer of an air washer in a public building designed to care for 52,000 cu. ft. of air per minute, date August 5, 1907:

Temperature of outside air 91°, humidity 52%. Temperature of the air after going through the washer 83°. This reduction of 8° was accomplished without entrained water or excess moisture being carried into the building.

The temperature of the circulating water was reduced to 75°, largely due to the fact that the air washer was being operated greatly in excess of its rated capacity.

The change of temperature accomplished by the air washer will always be proportional to the degree of saturation of the air before entering the air washer. The higher the temperature of the air the lower the relative percentage of humidity under normal conditions.

Of course there will be occasional hot days when the humidity is high when the air washer will not be as effective as it was on this day, but the average humidity of this State is given by the United States Weather Bureau as about 60% at 7 P. M.

In the hottest part of the day it would be considerably less. So when the temperature ranges from 90° to 100°, with an average humidity, the air washer, when properly operated, is capable of cooling the air for the

building from 12° to 15° and, in very dry weather, is capable of doing even better.

The cost of operation in reducing the temperature of this large volume of air is practically nothing as the same water is used over and over, the only loss being that due to evaporation.

EFFECT OF SAME AIR WASHER IN CLEANING AIR

"Five pounds of mixed lamp black, powdered chalk and fire clay were obtained, making the most severe substitute we could think of for the dust in the air. This was sifted through a flour sifter over the inlet to the air washer. The outlet to the air washer is 72 sq. ft. in area and in this was fixed a cheese cloth screen measuring 24 sq. ft. in area. The screen was weighed on delicate druggists' scales and, when clean, weighed 4 15/16 oz.

"The average of three anemometer readings of the volume of air going through the washer was 60,666 cu. ft. per minute. The contract requirements for which the washer was designed was for about 52,000 sq. ft. of air per minute.

"After the dirt had been sifted into the washer and the air drawn through for some time, the cheese cloth screen was again weighed and was found to have gained 5/96 of an oz. Under the contract guarantee, the washer was to remove 96% of the dust in the air.

"The 5 lbs. of dust inserted = 80 oz. avoirdupois. 4% of the dust could be allowed to remain under the guarantee. The screen covered only one-third of the area, hence 3200 ÷ 3 = 1.06 oz., which might have been caught and the guarantee fulfilled.

"Therefore, had the area all been screened, there would have been collcted 15/96 oz., which equals less than 0.15 oz. or 1/7 of the dust permissible. Had seven times this amount been caught, the guarantee would still have been fulfilled.

"The above test is the one commonly used in testing this apparatus, but may, of course, be subject to some inaccuracy. The margin is so large that it is, however, to our mind, a conclusive demonstration of efficiency."

The first paper on the programme entitled, "The Effect of Painting Radiating Surfaces," was then read by the author, Prof. John R. Allen.

The next paper was entitled, "Heating and Ventilating System, Finney Chapel, Oberlin College, Oberlin, Ohio," by Burt S. Harrison. It was read by Mr. Macon.

A paper entitled, "Safeguarding our Profession," was read by Secretary William M. Mackay, and is published herewith.

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*Safeguarding Our Profession**

By Wm. M. Mackay

While we possibly number among our members two-thirds of the competent heating and ventilating engineers in the United States, it is a positive fact that we do not number 20% of those who attempt to design and superintend the installation of heating and ventilating apparatus, and who, in many cases, lacking knowledge and experience in the subject, design apparatus which, on account of their lack of experience, is faulty both in design and operation and is neither efficient nor economical, bringing discredit on the entire profession. This is more noticeable in public work, such as schools and public buildings, where, in many cases, a competent heating and ventilating engineer is not employed, but where the heating contractor is also the designer, and, as in this class of work it is customary to accept the lowest bid regardless of the efficiency or completeness of the apparatus for the purpose intended, many of these buildings which should be the best models of heating and ventilation, are the poorest, and are, in many cases, through the lack of

*From a paper read before The American Society of Heating and Ventilating Engineers, at Indianapolis, July 15, 1909.

knowledge and experience of the designers, dismal failures.

At the last annual meeting of the society I spoke on this subject under a topic, "The Necessity for Having Ventilation Laws Apply to the Installation of Apparatus in Old as Well as New Buildings," citing a case where a school board composed of fifteen members, in a State which has a school-house ventilating law in force, employed a person who had no knowledge of the existence of the law and no previous experience, to design a ventilating apparatus for a large school building built some years before. After he had completed his design they employed an architect, licensed by the State, to draw up the contract, which was taken by the designer and the work installed.

After he had completed the contract I was called in to pass on the work before its final acceptance and payment. Up to this time they were of the opinion that the apparatus, which had been placed during the summer vacation and not operated, was all that they anticipated and desired, and they merely wished it approved before making the final payment. I had to tell them that the apparatus did not come within 75% of complying with the State law, that it had many faults which were both dangerous to health and life, but that the contractor had done all that he had agreed to under the proposition except that, having designed and installed the apparatus, he did not comply with that part of the proposition where he agreed "to do this work in the best possible manner," and that they, as a school board, and their licensed architect, should at least know and comply with the law.

I also cited another case of a twelve-room school-house in the same State which was formerly heated by hot air with no attempt at ventilation. I advised with the school board as to the best and most economical manner of placing a steam heating and ventilating apparatus which would comply with the State law. The school board found that the law did not apply to buildings already constructed, and so they finally decided to place an ordinary direct radiation heating apparatus, with no ventilation, in this building occupied by over 600 scholars, although the saving in cost on the entire apparatus was only about 20% below what a complete heating and ventilating apparatus would have cost.

I took this matter up with the State Superintendent of Public Instruction, and he wrote, "I regret to advise you that the law does not compel the Board of Education to provide a system of ventilation when a heating plant is installed in a school building erected prior to the enactment of the law," and when I told him that I would use my utmost endeavors to secure legislation which would insure suitable provision for the ventilation of a building when a new heating plant was installed, he wrote, "The information contained in my letter was given with some reluctance, as a great majority of boards of education believe that provision for ventilation must be made in all such cases."

Dr. A. B. Poland, Superintendent of Public Schools, Newark, N. J., at the National Convention of the Society for the Study and Prevention of Tuberculosis, at Washington, D. C., last May, made the following statement, in the course of his remarks on "Relation of Public Schools to the Anti-Tuberculosis Movement," which was published under the heading: "Few Schools Properly Ventilated and Heated."

SCHOOL CONSTRUCTION DEFECTS

"Scattered throughout the country are school buildings by the thousand wherein artificial heating and ventilating apparatus has been installed that is not only practically useless, but worse than useless, since it compels school children to breathe noxious and often fetid air, when only the window separates them from God's pure atmosphere.

"But it is forbidden to open the windows! Talk of juggernauts, there never was a more hideous juggernaut than that of a worthless system of artificial school ventilation. It is not my purpose to inveigh against artificial

heating and ventilating; far from it, but I do protest most emphatically against those pseudo and abortive systems so frequently installed even by some of our most distinguished heating and ventilating engineers.

"I have in mind as an instance a school building of twenty-three rooms, located not far from New York, in the erection of which one of the foremost engineers and publicists was employed to devise and supervise the heating and ventilating system. No care nor expense seems to have been spared; but when the system was put in operation six of the twenty-three rooms could not be heated, and, of course, could not be ventilated. But, despite the protests of superintendent, teachers and pupils, the 'system' had to be worked. It had been paid for, and how could the cost to the city be otherwise justified?

"The fact is that heating and ventilating are far from being a science. Sometimes engineers hit it; oftener they do not."

There is some truth in his statements. I know of the particular case to which he refers, and I am pleased to say that the party who designed this heating and ventilating system was not a member of our society. There are, however, many thousand properly designed heating and ventilating apparatus in this country that do operate properly, showing results, efficiency and economy. I feel that our society, which is now in its sixteenth year, comprising the majority of the competent and experienced heating and ventilating engineers in the country, should devise some method to protect its members, other competent heating and ventilating engineers, the public, and the children who have to suffer from the mistakes of faulty apparatus designed and placed, particularly in school buildings, making an annual waste of millions of dollars, and bringing discredit on our profesion. It is along these lines that I asked our society at the last annual meeting, if there should be State control for heating and ventilating engineers. The opinion of some of those present was that this matter would right itself in time, they felt that bringing our society more prominently to the attention of the public would insure competent heating and ventilating engineers being employed for this work, and increase the value of membership in the society.

I would welcome anything that would improve existing conditions and that would insure the employment of competent heating and ventilating engineers at a fair remuneration for this class of work, and which would prevent the employment of incompetent or inexperienced persons at any price.

It is a fact that many professions and occupations less important than ours are protected by State laws in many, posibly all of the States, preventing any but competent, experienced and licensed persons practicing their profession or calling, and it seems to me that if State protection is not the proper method to safeguard our profession and protect the public from imposition, our society should formulate some plan to protect its members and to prevent the public from being imposed upon, and to carry out Section 3 of the original objects of the society, which is, "The maintenance of a high professional standard among heating and ventilating engineers."

The discussion of a topic on the fire risk in connection with heating and ventilating systems brought out the fact that the society has resigned as members of the New York Board of Fire Underwriters.

Thursday evening the members and guests were entertained by an address on "School Hygiene," by Dr. J. N. Hurty, Commissioner of Health for Indiana. Dr. Hurty spoke at length of the efforts to improve the conditions of the school children in Indiana, with special reference to the heating and ventilating of such buildings. As an instance of some of the conditions he stated that he found school buildings located on such low and damp ground that there was a constant dripping of moisture inside the brick walls due to capillary action. Dr. Hurty made the broad statement that in the United

States to-day, 1,000,000 school children are under sentence of death. These figures, he said, were conservatively based upon the number of sickly children found in the Indiana schools whose physical condition could be accurately traced to poorly ventilated school rooms. The conservation of human health, he said, was the most important subject before the public, and he congratulated the society in being devoted to an object of such magnitude and importance.

Friday Morning Session, July 16

The morning session on Friday was opened by the reading of a paper on "A Combination Ventilating, Heating and Cooling Plant in a Bank Building," by A. M. Feldman, of New York. Mr. Feldman's paper is presented herewith.

*A Combination Ventilating, Heating and Cooling Plant in a Bank Building**

By A. M. Feldman

The object of this paper* is to give data and results of the regular operation of a ventilating, heating and cooling plant installed in a bank building in New York City for the firm of Kuhn, Loeb & Co. In view of the relative scarcity of information of this character and the growing in favor of artificially cooling air supplied for ventilation purposes, it is hoped the figures will prove of value. The plant is now in its third year, and some interesting facts have been learned with regard to the best manner of introducing the cool air in summer, to the use of steam heating coils for the refrigerated medium, which, to the best knowledge of the writer, is the first time that it has ever been attempted, to the amelioration of drafts from windows, and finally to the use of the exhaust air from the banking rooms in cooling the engine-room.

The points to be considered are involved in the part of the plant serving the banking offices of Kuhn, Loeb & Co., comprising about 85,000 cu. ft., in the ground floor of that company's 20-story building on William and Pine Streets. The building is of L shape, giving light in the rear, with the ground floor extending over the entire lot, with a skylight over the extension. Mechanical ventilation, to insure a constant supply of fresh air with a coincident removal of the vitiated air, is provided for the banking offices only. The building has its own isolated power plant, which is located in the basement. Two-thirds of the ground floor is thus directly over the boiler and engine-rooms (there is no sub-basement in this building).

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The writer was called upon to devise a scheme for the introduction of a supply of fresh air without going through the engine and boiler-rooms in the basement, also for cooling the banking rooms, to counteract the heat from the floor and make the occupants comfortable. After a careful study of the situation, the writer designed a *combination ventilating, heating and cooling plant*, which was installed under his supervision, and which has given very satisfactory results for the past three years.

LOCATION OF APPARATUS

The blower, coils, air washer, etc., were located on a part of the roof over the first floor extension, drawing

*Read before The American Society of Heating and Ventilating Engineers at Indianapolis, July 16, 1909.

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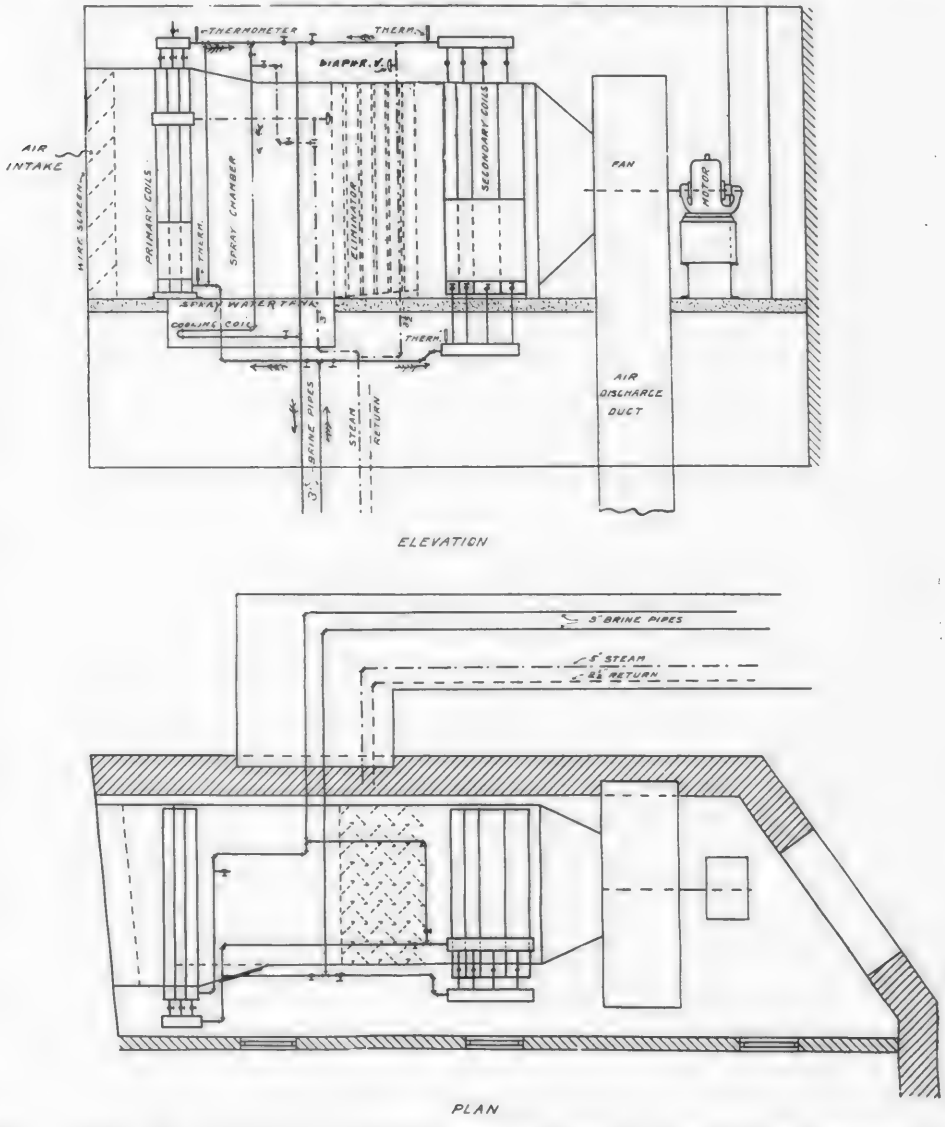

FIG. 1. PLAN AND ELEVATION, SHOWING ARRANGEMENT OF AIR SUPPLY APPARATUS AND CONNECTIONS

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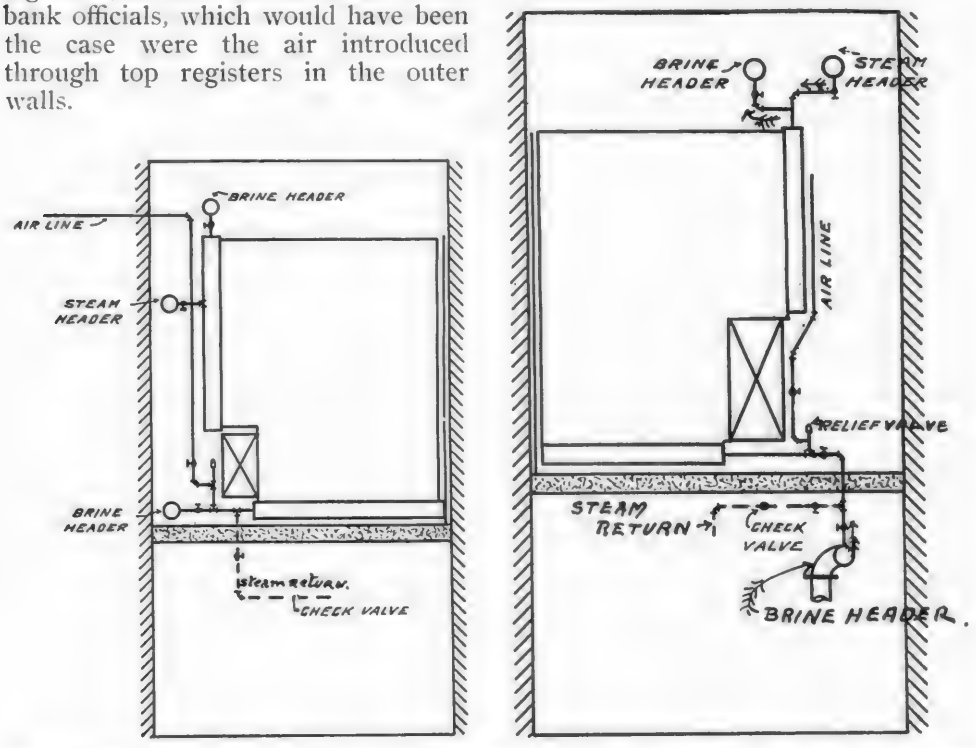

FIG 2. END VIEWS OF COILS, SHOWING ARRANGEMENT OF STEAM AND BRINE HEADERS

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The steam and brine are caried from the engine-room a distance of about 80 ft. The steam headers are provided with automatic temperature regulation which enables them to maintain a uniform temperature in the bank (Fig. 4). As the apparatus is removed from the immediate supervision of the engineers, three recording thermometers were installed: one to register the outdoor temperature at the intake of the fresh air, one the temperature of the air after it has passed the fan, and the third thermometer to record the bank temperature. The clockwork and dials are located in the engine-room in sight of the engineers.

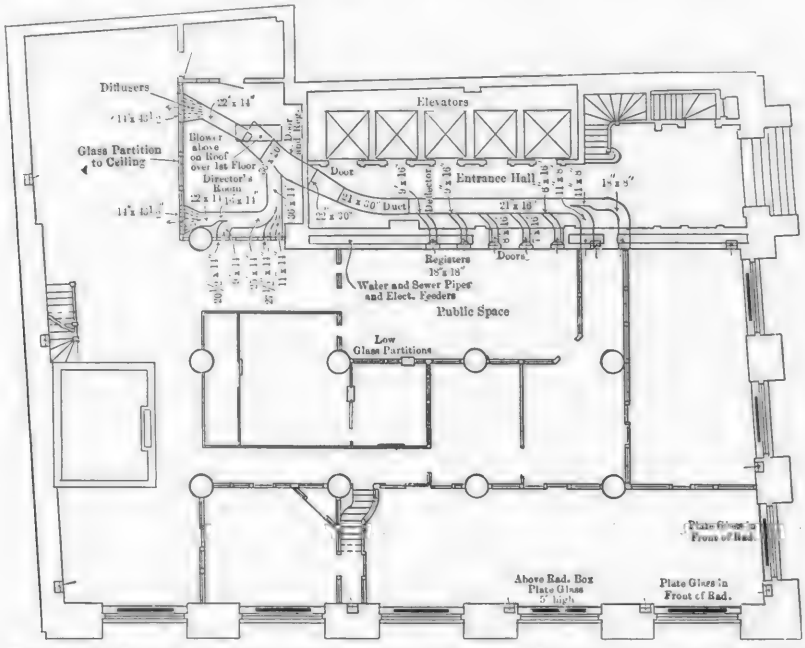

FIG. 3. FLOOR PLAN OF COMBINATION VENTILATING, HEATING AND COOLING PLANT FOR A BANK BUILDING, SHOWING DUCTS

THE REFRIGERATING PLANT

The refrigerating plant for cooling the calcium chloride brine, which is being circulated through the coils to cool the air in the summer, consists of a 20-ton marine type machine of the compression system with cross compound steam cylinders and two ammonia cylinders, double-pipe condenser and double-pipe refrigerator. Everything is so piped that one-half of the

knowledge and experience of the designers, dismal failures.

At the last annual meeting of the society I spoke on this subject under a topic, "The Necessity for Having Ventilation Laws Apply to the Installation of Apparatus in Old as Well as New Buildings," citing a case where a school board composed of fifteen members, in a State which has a school-house ventilating law in force, employed a person who had no knowledge of the existence of the law and no previous experience, to design a ventilating apparatus for a large school building built some years before. After he had completed his design they employed an architect, licensed by the State, to draw up the contract, which was taken by the designer and the work installed.

After he had completed the contract I was called in to pass on the work before its final acceptance and payment. Up to this time they were of the opinion that the apparatus, which had been placed during the summer vacation and not operated, was all that they anticipated and desired, and they merely wished it approved before making the final payment. I had to tell them that the apparatus did not come within 75% of complying with the State law, that it had many faults which were both dangerous to health and life, but that the contractor had done all that he had agreed to under the proposition except that, having designed and installed the apparatus, he did not comply with that part of the proposition where he agreed "to do this work in the best possible manner," and that they, as a school board, and their licensed architect, should at least know and comply with the law.

I also cited another case of a twelve-room school-house in the same State which was formerly heated by hot air with no attempt at ventilation. I advised with the school board as to the best and most economical manner of placing a steam heating and ventilating apparatus which would comply with the State law. The school board found that the law did not apply to buildings already constructed, and so they finally decided to place an ordinary direct radiation heating apparatus, with no ventilation, in this building occupied by over 600 scholars, although the saving in cost on the entire apparatus was only about 20% below what a complete heating and ventilating apparatus would have cost.

I took this matter up with the State Superintendent of Public Instruction, and he wrote, "I regret to advise you that the law does not compel the Board of Education to provide a system of ventilation when a heating plant is installed in a school building erected prior to the enactment of the law," and when I told him that I would use my utmost endeavors to secure legislation which would insure suitable provision for the ventilation of a building when a new heating plant was installed, he wrote, "The information contained in my letter was given with some reluctance, as a great majority of boards of education believe that provision for ventilation must be made in all such cases."

Dr. A. B. Poland, Superintendent of Public Schools, Newark, N. J., at the National Convention of the Society for the Study and Prevention of Tuberculosis, at Washington, D. C., last May, made the following statement, in the course of his remarks on "Relation of Public Schools to the Anti-Tuberculosis Movement," which was published under the heading: "Few Schools Properly Ventilated and Heated."

SCHOOL CONSTRUCTION DEFECTS

"Scattered throughout the country are school buildings by the thousand wherein artificial heating and ventilating apparatus has been installed that is not only practically useless, but worse than useless, since it compels school children to breathe noxious and often fetid air, when only the window separates them from God's pure atmosphere.

"But it is forbidden to open the windows! Talk of juggernauts, there never was a more hideous juggernaut than that of a worthless system of artificial school ventilation. It is not my purpose to inveigh against artificial

heating and ventilating; far from it, but I do protest most emphatically against those pseudo and abortive systems so frequently installed even by some of our most distinguished heating and ventilating engineers.

"I have in mind as an instance a school building of twenty-three rooms, located not far from New York, in the erection of which one of the foremost engineers and publicists was employed to devise and supervise the heating and ventilating system. No care nor expense seems to have been spared; but when the system was put in operation six of the twenty-three rooms could not be heated, and, of course, could not be ventilated. But, despite the protests of superintendent, teachers and pupils, the 'system' had to be worked. It had been paid for, and how could the cost to the city be otherwise justified?

"The fact is that heating and ventilating are far from being a science. Sometimes engineers hit it; oftener they do not."

There is some truth in his statements. I know of the particular case to which he refers, and I am pleased to say that the party who designed this heating and ventilating system was not a member of our society. There are, however, many thousand properly designed heating and ventilating apparatus in this country that do operate properly, showing results, efficiency and economy. I feel that our society, which is now in its sixteenth year, comprising the majority of the competent and experienced heating and ventilating engineers in the country, should devise some method to protect its members, other competent heating and ventilating engineers, the public, and the children who have to suffer from the mistakes of faulty apparatus designed and placed, particularly in school buildings, making an annual waste of millions of dollars, and bringing discredit on our profesion. It is along these lines that I asked our society at the last annual meeting, if there should be State control for heating and ventilating engineers. The opinion of some of those present was that this matter would right itself in time, they felt that bringing our society more prominently to the attention of the public would insure competent heating and ventilating engineers being employed for this work, and increase the value of membership in the society.

I would welcome anything that would improve existing conditions and that would insure the employment of competent heating and ventilating engineers at a fair remuneration for this class of work, and which would prevent the employment of incompetent or inexperienced persons at any price.

It is a fact that many professions and occupations less important than ours are protected by State laws in many, posibly all of the States, preventing any but competent, experienced and licensed persons practicing their profession or calling, and it seems to me that if State protection is not the proper method to safeguard our profession and protect the public from imposition, our society should formulate some plan to protect its members and to prevent the public from being imposed upon, and to carry out Section 3 of the original objects of the society, which is, "The maintenance of a high professional standard among heating and ventilating engineers."

The discussion of a topic on the fire risk in connection with heating and ventilating systems brought out the fact that the society has resigned as members of the New York Board of Fire Underwriters.

Thursday evening the members and guests were entertained by an address on "School Hygiene," by Dr. J. N. Hurty, Commissioner of Health for Indiana. Dr. Hurty spoke at length of the efforts to improve the conditions of the school children in Indiana, with special reference to the heating and ventilating of such buildings. As an instance of some of the conditions he stated that he found school buildings located on such low and damp ground that there was a constant dripping of moisture inside the brick walls due to capillary action. Dr. Hurty made the broad statement that in the United

States to-day, 1,000,000 school children are under sentence of death. These figures, he said, were conservatively based upon the number of sickly children found in the Indiana schools whose physical condition could be accurately traced to poorly ventilated school rooms. The conservation of human health, he said, was the most important subject before the public, and he congratulated the society in being devoted to an object of such magnitude and importance.

Friday Morning Session, July 16

The morning session on Friday was opened by the reading of a paper on "A Combination Ventilating, Heating and Cooling Plant in a Bank Building," by A. M. Feldman, of New York. Mr. Feldman's paper is presented herewith.

*A Combination Ventilating, Heating and Cooling Plant in a Bank Building**

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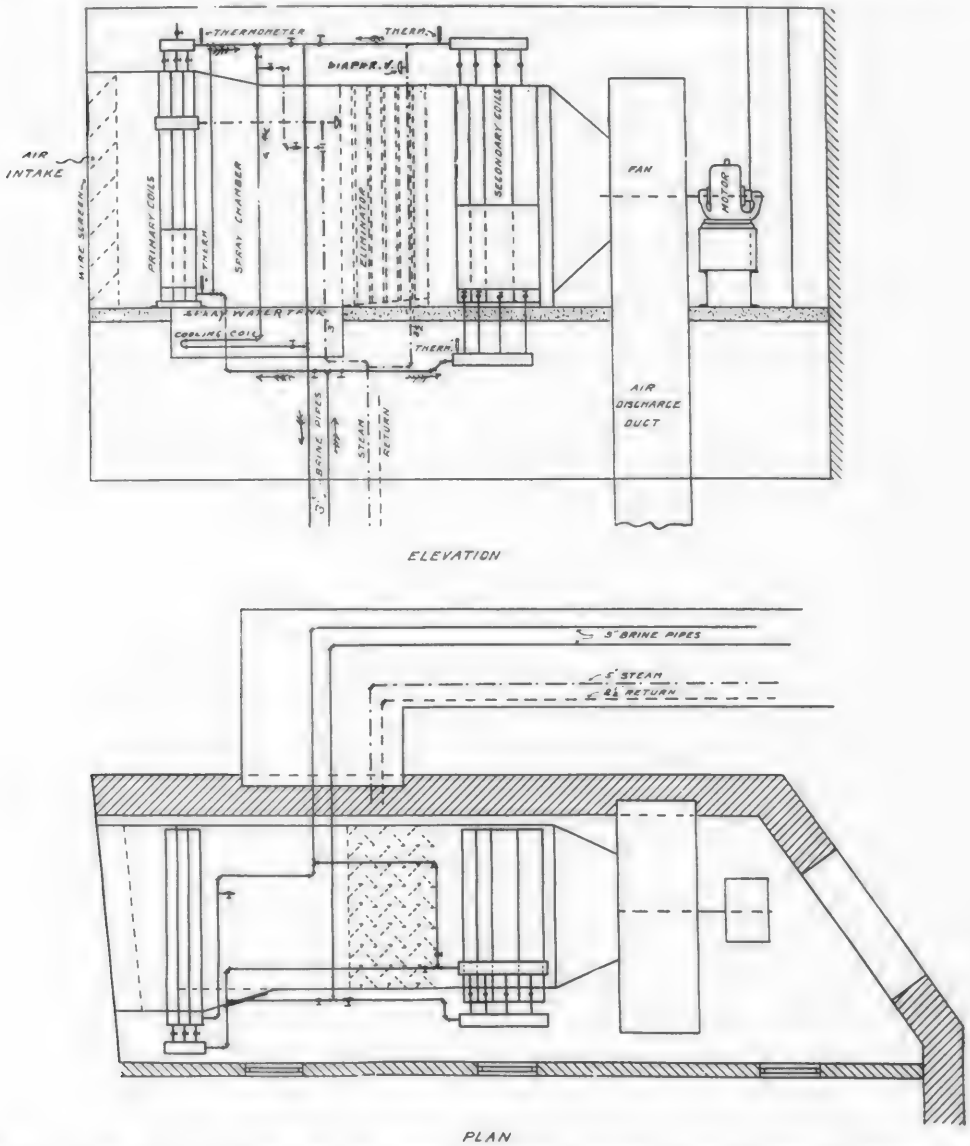

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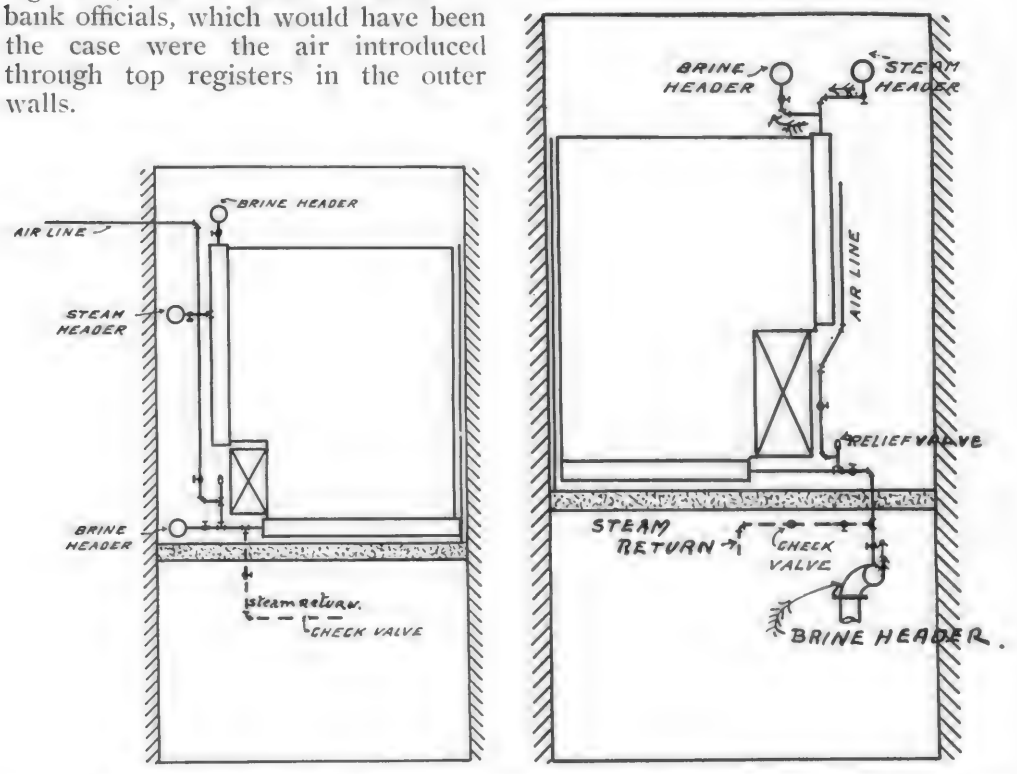

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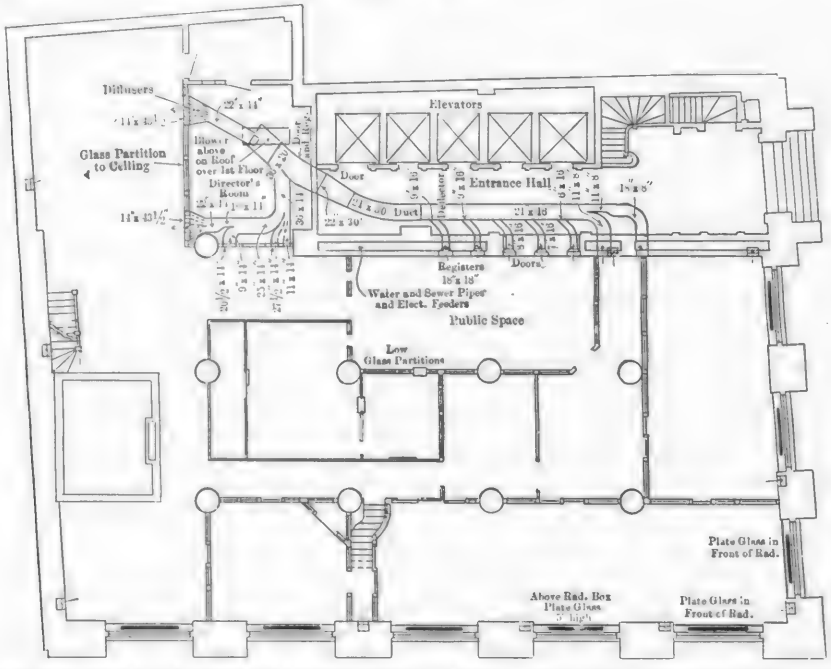

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The refrigerating plant for cooling the calcium chloride brine, which is being circulated through the coils to cool the air in the summer, consists of a 20-ton marine type machine of the compression system with cross compound steam cylinders and two ammonia cylinders, double-pipe condenser and double-pipe refrigerator. Everything is so piped that one-half of the

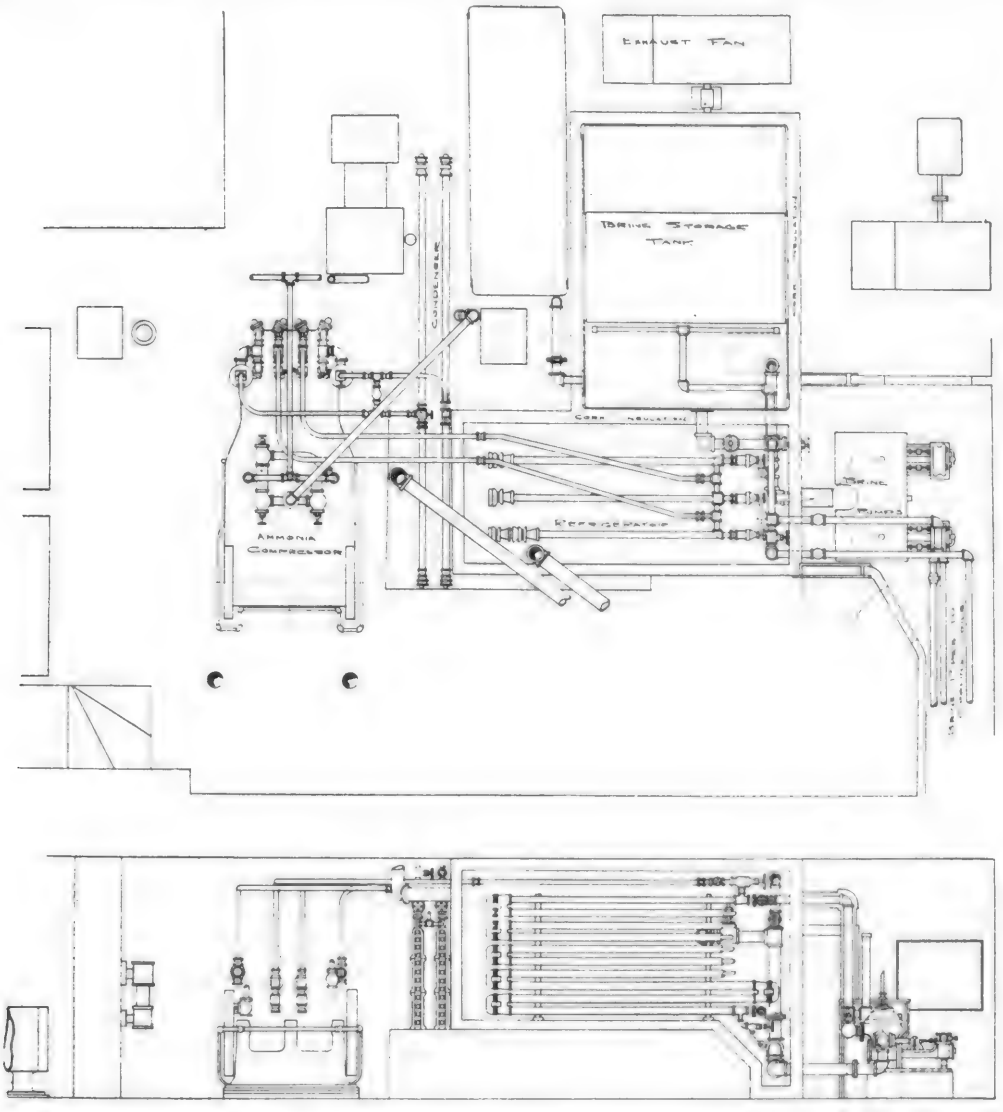


FIG. 4. GENERAL ARRANGEMENT OF REFRIGERATING PLANT, KUHN, LOEB & CO. BUILDING

plant could be run in case the other half is disabled.

The writer calculated that 30 tons refrigeration were necessary, but there was no room for a larger machine, so a brine storage tank was installed with the idea that the machine is to be run for a few hours at night time to store up low-temperature brine, which helps the machine during the daytime.

There are two 6-in. by 8½-in. by 6-in. duplex steam-driven pumps for circulating the brine through the cooling coils. The pumps deliver the brine from the storage tank through the refrigerators and up to the coils. The brine from the latter returns to the brine storage tank. A meter is installed on the delivery main near the pumps. There are also thermometers.

The piping, coils and headers are so arranged that were there greater capacity in the refrigerating machine, the air would be cooled to a lower degree, so as to remove a great deal of the absolute humidity. For instance, the primary coils could be utilized for cooling purposes and, indeed, a part of the main heater, the other part to be used to reheat the air to the desired temperature, controlling it automatically. Under such conditions a consid-

erably lower relative humidity could be obtained in the banking rooms.

The plant has turned out to be of just the necessary capacity to lower the temperature of the outside air about 20° F., and maintain the air in the bank 10° lower than outside in the hottest weather (Fig. 6). This difference was found to give the desired comfort, without causing unpleasant drafts, or chilled sensation in entering the room.

From 14 to 16 rows of coils are used in the early morning to bring down the temperature in the bank, which has become warmed during the night, and only 12 or 14 rows to do the work during the entire day, in the hottest weather, to maintain the 10° difference between outdoors and the banking rooms.

TEST NO. 1, JUNE 25, 1909

Taking for an example an observation and test made in the afternoon of June 25, 1909, the following data were obtained:

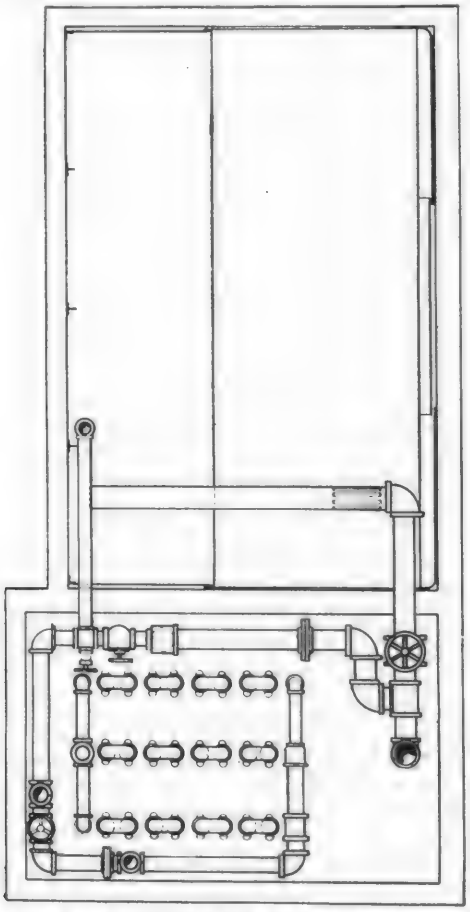


FIG. 5. END VIEW OF REFRIGERATING PLANT

Cooling coils used—12 rows, 2 in the primary and 10 in the secondary coils, or a total surface of 447.6 sq. ft.

Outdoor temperature, 91° F.

Outdoor relative humidity, 53%.

Temperature—the air was cooled down to and introduced into the banking rooms at 71° F.

Average temperature in the banking rooms, 81° F.

Relative humidity in the banking rooms, 63%.

Temperature of brine at circulating pump, going out 35° F., returning at 38° F., a rise of 3° F.

Temperatures of brine at cooling coils entering and leaving same 35¼° F. and 37¾° F. respectively, a rise of 2.5° F.

Amount of calcium chloride brine circulated through the system was equivalent to 21.5 cu. ft. per minute.

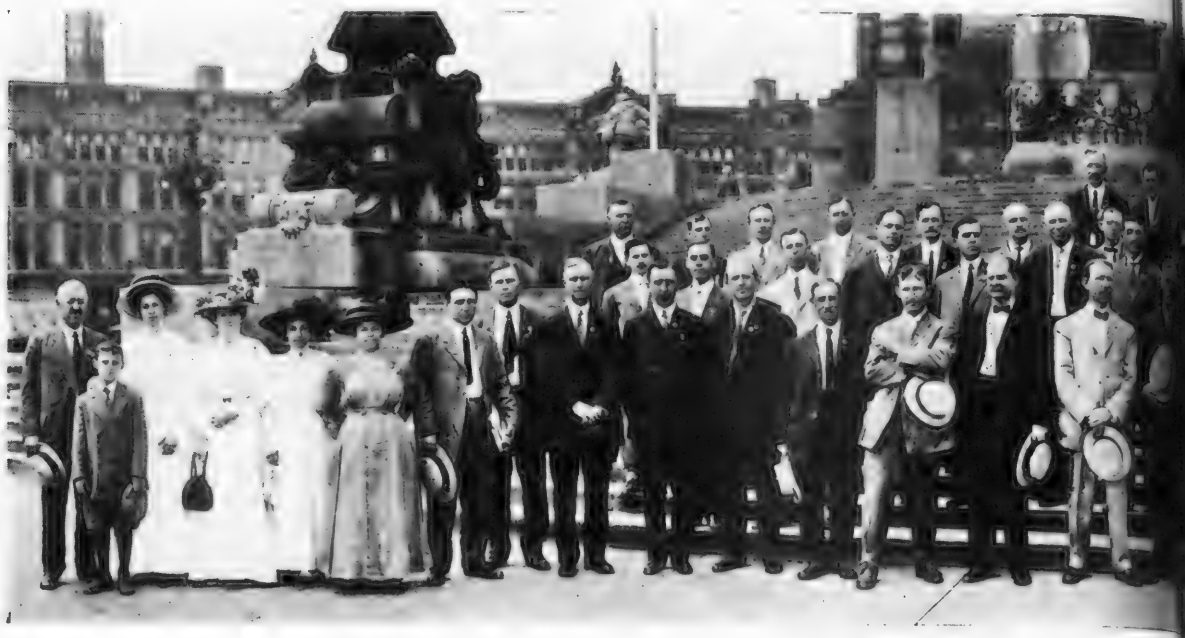
REFRIGERATION ACCOMPLISHED

Taking the weight of a cubic foot of calcium chloride liquid at the density which was being used as 73 lbs., also asuming the specific heat as 0.82 the heat (H) absorbed by the brine from the cooling coils, and, therefore, from the air in an hour would be equal to $(21.5 \times 73 \times 2.5 \times 0.82 \times 60) = 193{,}048$ B. T. U.

One ton refrigerating capacity is defined as being equal to the heat transfer involved in the freezing or melting of 2,000 lbs. of ice in 24 hours. The latent heat of ice being 142.2 B. T. U. per pound for 2,000 lbs., this represents 284,400 B. T. U. per 24 hours, or about 12,000 B. T. U. per hour.

In other words, 1 ton refrigerating capacity for one day is equivalent to the performance of 12,000 B. T. U. every hour. If we divide the total heat (H) as calculated by 12,000, the result will be the tons of refrigeration accomplished by the brine on the coils, thence on the air, namely, $(193{,}048 \div 12{,}000) = 16.1$ tons refrigeration.

As shown above, there was 0.5° F. loss in the two main calcium chloride brine pipes between the pump and the bunker of coils, which represents by



MEMBERS AND GUESTS IN ATTENDANCE AT THE SUMMER MEETING OF THE

the same method of calculation an equivalent of (21.5 × 73 × 0.5 × 0.82 × 60) ÷ 12,000 = 3.21 tons refrigeration. Total work done by the refrigerating machine equal to 19.31 tons, not counting losses between the refrigerator, storage tank and pumps.

Thus the machine has been tasked to its full capacity and somewhat over.

AIR COOLING

The volume of air which passed over the cooling coils and was introduced into the rooms was measured by an anemometer and amounted, as stated, to about 390,000 cu. ft. per hour. The air was cooled from 91° to 71°, or 20° F. One cubic foot at the average temperature along the coils cooled 1° gives off 0.0175 B. T. U., hence 390,000 cu. ft. cooled 20° F. gave up 136,500 B. T. U. in an hour, an equivalent of a performance of 11.3 tons of refrigeration for cooling the air (12,000 B. T. U. representing the heat equivalent of one ton refrigeration).

ABSOLUTE HUMIDITY

The weight of a cubic foot of aqueous vapor at different temperatures and percentages of saturation is called the absolute humidity.

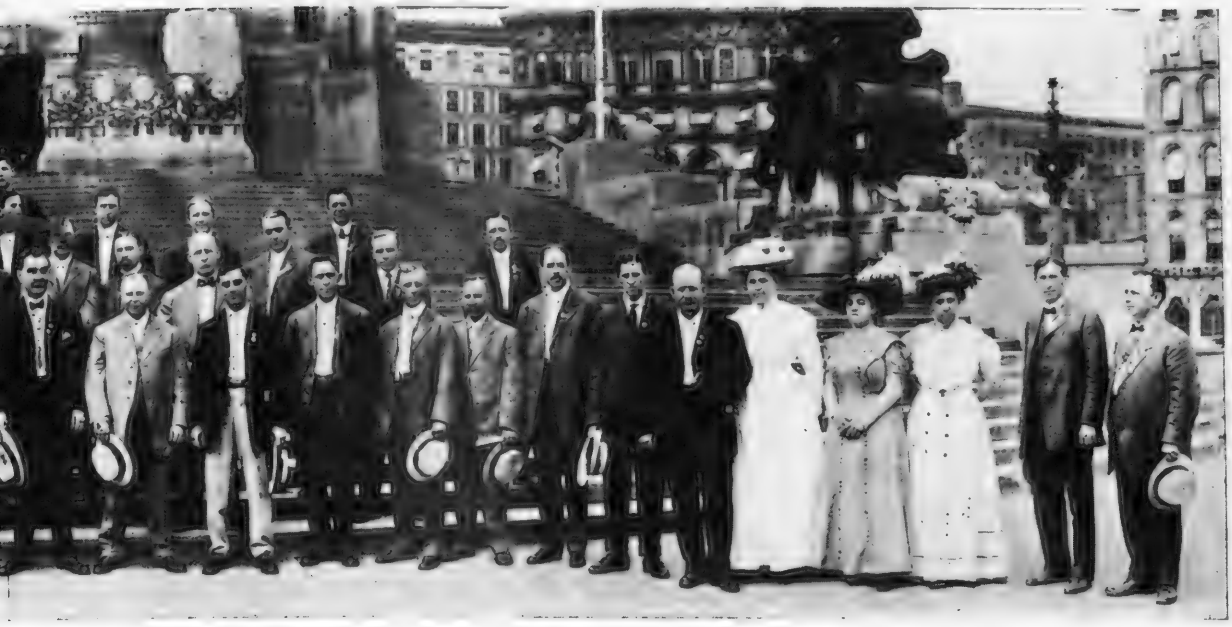
The absolute humidity of the outdoor air, at 91° F. and 53% relative humidity equals 8.074 grains; that of the air in the banking rooms at 81° F. and 63% relative humidity is 7.103 grains. The 390,000 cu. ft. of air at 91° F. will be about 382,000 cu. ft. at 81° F. Therefore, the moisture contained in the air in the bank is less than that originally contained in the same air by an amount equal to (390,000 × 8.074 — 382,000 × 7.103) = 435,500 grains, or 62.2 lbs.

Moisture has been added to the air in the rooms by the vapor given off by the occupants of the rooms in the products of respiration.

This quantity, however, is small in comparison with the total amount, as the average supply of moisture by the human body is 1-15 lb. per hour. There are only about 33 people constantly in the banking rooms, the number of those coming in and leaving was not ascertained. Assuming all together about 40 persons in the banking rooms, it would make a correction of about 2.7 lbs.

8.074 × 390,000 ÷ 7,000 = 449.8 total pounds of aqueous vapor contained in the air per hour before being cooled.

7.103 × 382,000 ÷ 7,000 = 387.6 total pounds of aqueous vapor in the



RICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, INDIANAPOLIS, IND.

air in bank per hour. 2.7 = aqueous vapor given off by occupants of bank per hour. Therefore, 387.6 — 2.7 = 384.9 total pounds of aqueous vapor brought into bank per hour. 449.8 — 384.9 = 64.9, representing the pounds of moisture removed per hour from the air and which has been deposited on the cooling coils due to the process of refrigeration.

The latent heat of vapor at the average temperature of 81° F. is 1057.6 B. T. U. This multiplied by 64.9 and divided by 12,000 equals the equivalent of 5.7 tons of refrigeration. This represents the tonnage of performance in condensing the above amount of vapor and reducing the absolute humidity of the air delivered to the banking rooms.

Thus the total tonnage of refrigeration in the process of cooling the air and reducing the absolute humidity amounted to (11.3 + 5.7) 17.00 as against calculated 16.1 tons of refrigeration performed by the calcium chloride in the coils. Practically, the former figure ought to have been slightly less to account for losses in transmission. But the discrepancy may be accounted for in the readings of the thermometers, which are of commercial type and not finely graduated.

With the data observed the writer also checked the tonnage with the aid of chart No. 2 given in W. W. Macon's paper on "Air Cooling by Refrigeration," presented at the annual meeting of the society, 1909, (published in THE HEATING AND VENTILATING MAGAZINE for January, 1909) and found about the same, namely, that an equivalent of 5.3 tons of refrigeration were used in condensing and removing the above amount of vapor from the outdoor air. By the aid of the chart he also found that the air was not fully saturated when cooled to 71° F. No observations were made on the conditions of the relative humidity of the air as it left the bunker of coils.

The relative humidity in general was measured by means of a sling or whirled psychrometer. This instrument consists of a pair of thermometers, provided with a handle, which permits the thermometers to be whirled rapidly, the bulbs being thereby strongly affected by the temperature of and moisture in the air. The bulb of the lower of the two thermometers is covered with thin muslin, which is wet at the time an

observation is made. The psychrometric tables published by the United States Weather Bureau were used in these calculations for obtaining the relative and absolute humidities.

TEST NO. 2, JUNE 26, 1909, 10 A.M.

Cooling coils in use—4 rows of pipe in the primary and 10 rows in the secondary, or a total of 526.2 sq. ft. of cooling surface.

Outdoor temperature, 84½° F.

Outdoor relative humidity, 68%.

Temperature, the air was cooled down to 66° F.

Average temperature in the banking rooms, 77½° F.

Relative humidity in the banking rooms, 74½%.

Temperatures of calcium chloride at circulating pump going out and returning respectively—37½°, 40½°—a rise of 3° F.

Temperatures of brine at cooling coils—37¾°, 40¼°—a rise of 2.5° F. in refrigerating the coils, due to cooling the air reducing the absolute humidity.

The pump was running at same speed, circulating 21.5 cu. ft. of calcium chloride per minute.

REFRIGERATION ACCOMPLISHED

As the amount of calcium chloride circulated and rise in temperatures of the calcium chloride were the same as on the previous day, the same amount of work was performed by the refrigerating medium on the coils and air, namely, an equivalent of 16.1 tons of refrigeration.

AIR COOLING

The air was cooled from 84½° to 66° F., a drop of 18.5° F. The quantity of air passed over the coils was about 390,000 cu. ft. per hour. One cubic foot of air at the average temperature along the coils cooled 1° gives off .0177 B. T. U., hence the 390,000 cu. ft. cooled 18.5° F. gave off (0.177 × 18.5 × 390,000) = 127,686 B. T. U. in an hour, or an equivalent of work done of 10.64 tons of refrigeration in cooling the air.

ABSOLUTE HUMIDITY

The absolute humidity of the outdoor air at 84½° F. and 68% relative humidity is 8.531 grains per cu. ft., that of the air in the banking rooms at 77½° F. and 74½% relative humidity is 7.488 grains per cu. ft. Correcting the volume of 390,000 cu. ft. of the air due to the change in density, would make about 384,000 cu. ft. at 77½° F., hence (390,000 × 8.531 — 384,000 × 7.488) = 451,700 grains, or 64.5 lbs. of water. Correcting for the vapor given off by the occupants in the process of respiration, 67.2 lbs. of water were condensed on the coils and removed from the air per hour, due to the refrigerating effect of the calcium chloride in cooling the coils. The latent heat of vapor at the average (84½° to 66°) temperature of 75¼° F. is 1061.6 B. T. U. This multiplied by 67.2 lbs. and divided by 12,000 gives an equivalent of 5.9 tons of refrigeration. This represents the tonnage of performance in condensing the above amount of vapor and reducing the absolute humidity of the air delivered to the banking rooms.

From the chart above referred to, it figures out about 5.75 tons of refrigeration. The total tonnage of refrigeration in this test in both, the process of cooling the air and reducing the absolute humidity, amounted to (10.64 + 5.9) = 16.54 tons, as against the 16.1 tons of refrigeration calculated from the performance of the calcium chloride in the coils.

COEFFICIENT OF HEAT TRANSMISSION AT 780 FT. PER MINUTE VELOCITY, JUNE 25, 1909

The coils, as stated, were of the standard hot blast mitre type of 1-in. pipe. The full area of the secondary coils is equal to 8⅛ sq. ft. As the quantity of air delivered over them was about 390,000 cu. ft. per hour, or 6,500 cu. ft. a minute, the air velocity was 780 ft. per minute.

The mean temperature of the air, 91° — 71° = 81° F.

The mean temperature of the brine in coils = 36.5° F.

The difference of temperature between the air and brine = 44.5° F.

Total heat absorbed by the coils per hour = 193,048 B. T. U.

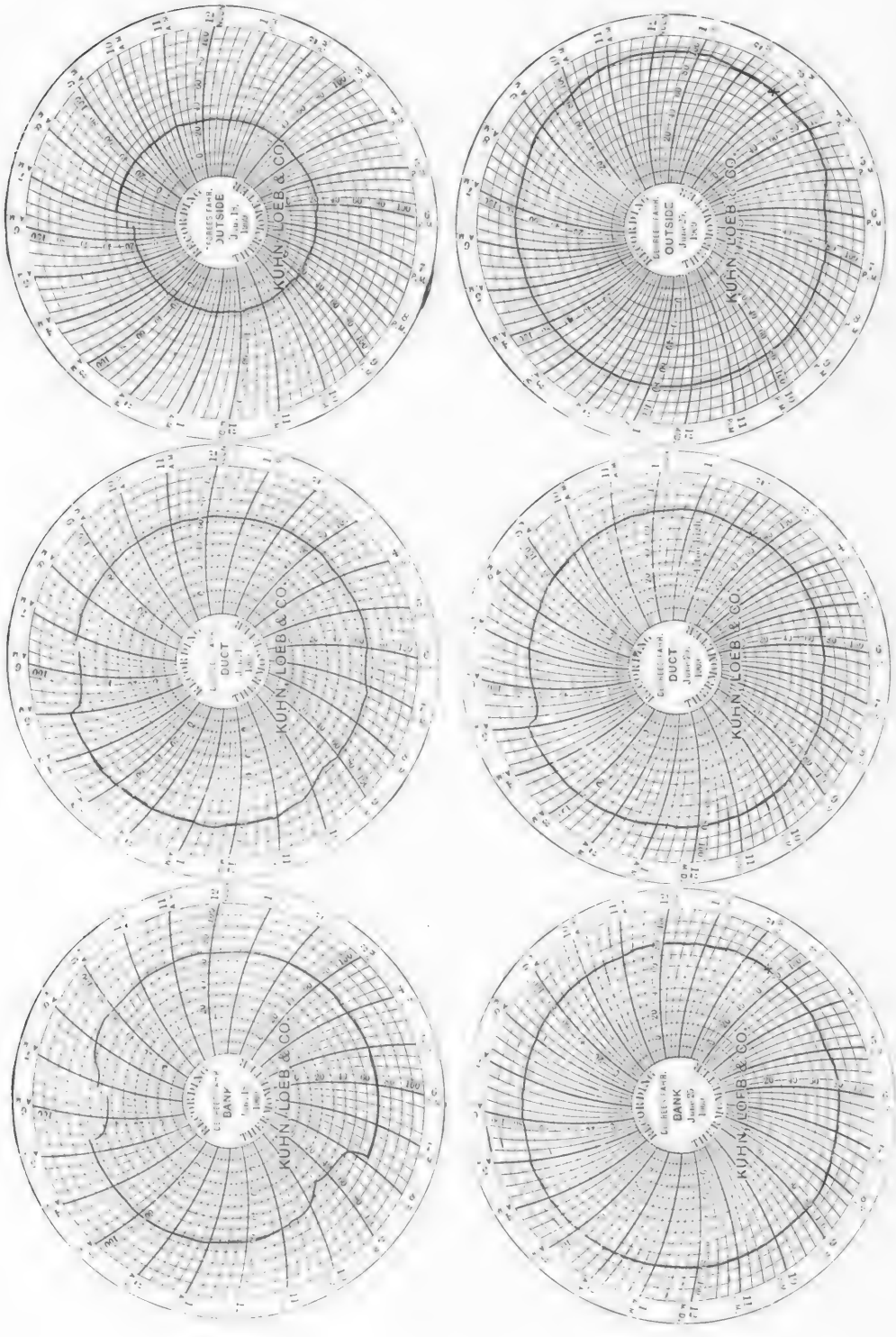


FIG. 6. RECORDS OF TWO TEMPERATURE TESTS

Total cooling surface in coils 447.6 sq. ft.

Heat transmitted per degree of difference of temperature per square foot per hour $= \frac{193{,}048}{447.6 \times 44.5} = 9.7$ B. T. U.

JUNE 26, 1909

The average temperature of the air was 75.25° F.

The average temperature of the brine in coils, 39° F.

Difference of temperature between the air and brine, 36.25° F.

Total heat absorbed by the coils per hour, 193,048 B. T. U.

Total cooling surface in the coils, 526.2 sq. ft.

Heat transmitted per degree difference of temperature per square foot per hour $= \frac{193{,}048}{526.2 \times 36.28} = 10.6$ B. T. U.

The average for the two tests is 10.15 B. T. U. per square foot of galvanized iron pipe with an air velocity of about 780 ft. per minute at the given

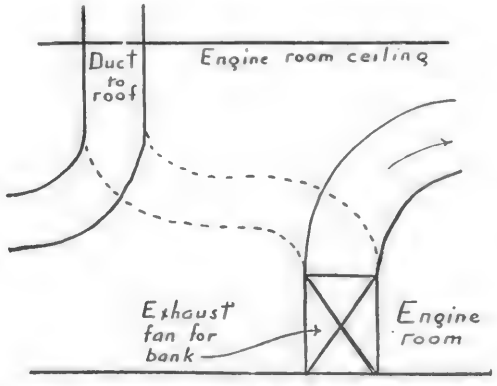


FIG. A—ALTERATIONS MADE TO ENABLE EXHAUST FAN FOR BANK TO DELIVER INTO ENGINE ROOM

difference of temperatures, and given temperature of refrigerating medium. With lower temperatures of the latter and different velocities of the air passing over the coils, the coefficient of heat transmission will vary.

It is to be hoped that the Committee on Tests of the society will take a hold of this problem, and, by using test thermometers and calibrated instruments, will obtain further data to establish standards. It is especially hoped that the method suggested in this paper of refrigerating the air down to low temperatures and then reheating it would be followed and observations made with various low relative humidities.

It is the belief of the writer that more comfort and better results would be obtained by furnishing drier air of a uniform relative humidity of

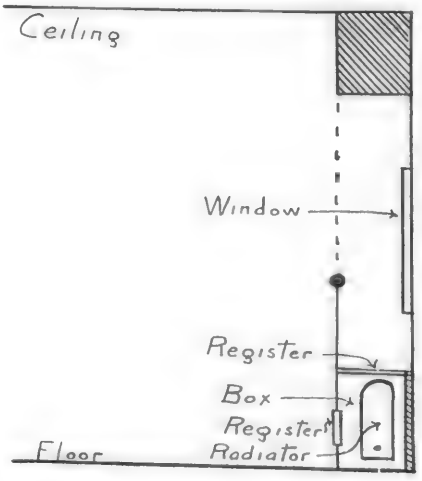


FIG. B—ARRANGEMENT OF WINDOW SHIELD TO AVOID DRAFTS

about 50% to 60% with rather a small difference of temperature between the outdoor and indoor conditions.

DISCUSSION

MR. FELDMAN: I would add that in this plant I found it was not advisable to drop the temperature of the entering more than 20° and then reheat it 10°, as otherwise those coming in from the outside would feel the chill. Two interesting features of this plant will, perhaps, be better understood from the accompanying drawings. In Fig. A is shown the exhaust duct which was at first connected to the duct to roof and afterwards made to discharge into the engine room. This cool air, being but little vitiated, lowers the temperature in the engine room 10°. Fig. B shows the arrangement that was adopted to overcome drafts due to the proximity of the duct registers to the windows. It may also be interesting to add the results of a test made July

12, 1909, too late for insertion in the paper. It was as follows:

	Temperature Dry Bulb.	Temperature Wet Bulb.	Relative Humidity.	Weight in grains of a cu. ft. of aqueous vapor at corresponding percentage of relative humidity.
Outdoors.....	82	75	72%	8.474
Inside bank.....	71	71	82	7.672
In duct at blower..	67½	65	87½	6.400

Among others who discussed the paper was Mr. Macon, who advocated the elimination of the reheater in such work on the ground that the process could be simplified by cooling the air only to the point required in the rooms.

Mr. Feldman, in reply, showed that the results would not be the same as the precipitation due to the additional lowering of the temperature would result in a smaller amount of humidity in the reheated air.

Speaking to the topic, "The requirements as regards tightness that should be met where a vacuum house heating system is to be installed," Mr. Hoffman said:

"Very often we find the trouble in the radiators themselves. To detect leaks we first use the pressure test and if that does not prove effective we try closing off all the radiators and turning them one by one."

MR. DONNELLY: That would seem to show that vacuum tests of radiators should be made.

MR. SPARKS: Tests by water might be effective. By filling a system with water at 1 lb. pressure, leaks of every description could be detected.

MR. SHERWOOD: I do not think water tests are reliable. I have seen tanks tested by water at 35 lbs. pressure show no leaks but they at once become apparent under air tests. One of the best methods to find air leaks is to apply soapsuds with a brush. Any leakage will be shown by the formation of bubbles.

Afternoon Session, July 16

The session opened with a paper on "Examples of Wind Effects on Ventilation and Heating," by H. W. Whitten.

Before the meeting adjourned, on motion of Mr. Donnelly, it was voted to appoint two committees, one to collect data in regard to the methods and appliances in connection with so-called mechanical vacuum heating systems and another committee to collect similar data in connection with so-called atmospheric vacuum systems. The make up of the committees was left to the Chair.

Entertainment Features

The entertainment of the visiting delegates was in the hands of a reception committee made up of Theodore Weinshank, Chairman; Prof. J. D. Hoffman, W. H. Johnson, John A. Hale, August Kehm, Sidney Fensternmaker, W. H. Conrad, Joseph Hayes, Thomas Tait, Mrs. Theodore Weinshank, Miss Anna Weinshank and Mrs. W. H. Johnson.

On the opening day of the meeting, Thursday morning, the ladies were given an automobile ride to the Country Club, where luncheon was served. In the afternoon, after a group picture of the convention had been taken in front of the Soldiers' Monument, the ladies were given a bird's eye view of Indianapolis from the top of the monument.

Friday afternoon, sight seeing and touring cars carried the entire party through the new motor speedway and through much of the North Side residence district. The day seemed made for the occasion and the outing was thoroughly enjoyed by all.

Friday evening the regular subscription dinner took place, under the auspices of the society, in the banquet hall of the Claypool Hotel. President William G. Snow acted as toastmaster. Dr. J. N. Hurty was given the toast, "The Little Things in Life." Dr. Hurty spoke of the fact that the ventilating engineers are dealing with the most minute bacteria and microbes known, but are, nevertheless, facing a problem quite as serious as many dealing with larger forms of life.

Prof. J. D. Hoffman, responding to the toast, "The Ethics of Our Profession" said, among other things:

"Every year I tell my graduating class to remember four things: That they must be honest, that they must be industrious, that they must be enthusiastic and that they must be courteous."

H. W. Whitten, of Detroit, spoke of the favorable outlook for compulsory school house ventilation laws in Indiana and urged coöperation with such organizations as the Association of Physical Directors.

Frank K. Chew spoke on "The Field" and E. A. May of Chicago on "The Trials of an Engineer." Other speakers were Theodore Weinshank and James A. Donnelly.

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NOTWITHSTANDING the assertions made now and then that engineers and technical men generally recognize the advantage of sharing their knowledge with others in their profession, it is noticeable that upon some subjects the most diligent inquiry fails to bring out more than a meager fund of information, even from those who are supposed to have the salient facts in their possession. Investigations that turn out to be incomplete, whether conducted by individuals or by committees, usually fail for this reason rather than through any lack of activity on the part of the investigators. It is still the exception, rather than the rule, to find men imparting what they are pleased to call their bread and butter to others without some decidedly tangible compensation. Such a reward as increased prestige or the satisfaction of having promoted the interests of the profession has little in it to attract their interest.

The one striking fact that stands out in disproof of the correctness of this attitude is the success of men who follow the more liberal method. It is only necessary to recall the names of the successful men in almost any line to discover that most of them have given freely of their time and knowledge to the advancement of the profession, not only after having attained success but at times when the struggle was keenest.

A RECENT contribution to a comparatively new phase of heating and ventilation, which, it seems to us, is worthy of special mention, is a description of a unique plant for a bank building, combining a heating, ventilating and cooling system, and designed by Mr. A. M. Feldman, of New York. The knowledge gained through observation of the operation of this plant, which he gives so freely in his paper, cannot fail to add materially in establishing a settled practice for this class of work.

PROBABLY the most important feature, from a practical standpoint, of the proposed plan for rating house heating boilers, recently submitted to the heating engineers' society, is the proposition to establish a board of appeals, to which manufacturers may go in case of dissatisfaction with the ratings that may be given their boilers. Inasmuch as the present constitution of the heating engineers' society specifically forbids the endorsement of any manufacturer's product, a plan has been proposed of naming a joint committee composed of representatives of the various interests involved, including the engineer, contractor and manufacturer.

A New Rapid Circulation Hot Water Heating System

The idea of making the operation of hot water heating apparatus independent of the difference in weight between water of different temperatures and of allowing the water to circulate rapidly through the pipes, in short, to substitute for the old-fashioned, slow method of heating a new and rapid system has inspired many inventions in the field of hot water heating.

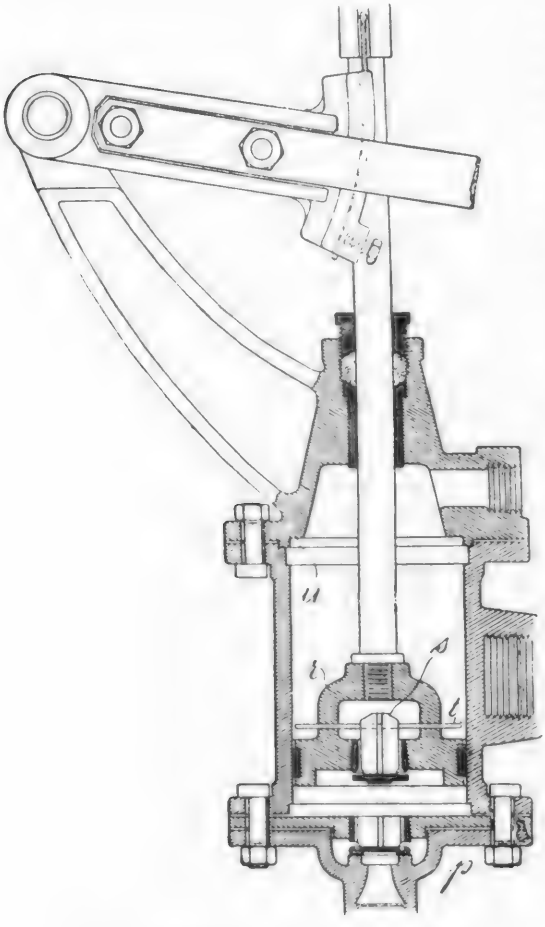


FIG. 1. STEAM CYLINDER OF TURUL SYSTEM

Regarding the existing systems of rapid circulation heating, it must be admitted that they possess many advantages. They are cheaper than the ordinary hot water heating systems, they can be employed in cases where the latter would be impracticable and they permit of the pipes being laid just as is most convenient in each particular case.

Their principal advantage is their cheapness, and they can only be brought into general use by still further increasing this advantage. Needless to say, cheapness must not be obtained at the cost of other good qualities.

Installations are cheapened to good effect when using rapid circulation systems by the fact that pipes of small section can be used and something is saved in heating surface. The cost of the circulating apparatus must, however, be covered before the installation can be regarded as cheapened. The simpler this apparatus can be made the cheaper the installation will be. In order to prove that a rapid circulation system may be made to attain the greatest possible degree of simplicity while fulfilling at the same time all necessary conditions such a system is described herewith following the same line of thought which led to its invention. It is known as the Turul rapid circulation heating system.

In the first place it is necessary to make quite clear what qualities a perfect rapid circulation heating system must possess, what parts are absolutely necessary to its construction, and in what manner these parts can be united in a system.

CONDITIONS THAT SHOULD BE MET IN AN IDEAL SYSTEM

The following conditions must be met by a perfect system.

1. A rapid circulation must be attainable.

2. The working of the system must be absolutely reliable.

3. The working of the system must not be dependent on the temperature of the water.

4. The system must not need more attention than an ordinary hot water system.

Conditions 1 and 3 can only be fully met by the use of a pump and, therefore, this must be regarded as a requisite.

Condition 2 requires that the plant contain no apparatus liable to break down, such as water level regulators or similar automatic arrangements.

Condition 4 requires that the installation should not need special attendance while in operation nor when starting up.

To return to the question of the pump. This leads to the question: where are we to take the power necessary for driving it? The employment of an outside source of supply is not a satisfactory solution of this problem, since such a source of supply is only in rare cases at our service and, even in such cases, causes an increase in the cost of working. We are therefore compelled to find the power necessary for driving the pump in the heating installation itself.

The ideal system would be to draw the energy directly from the hot water, but

for this we have no suitable apparatus at our service. As soon as our technical knowledge has progressed to the point of being able to provide such apparatus, the design of rapid circulation heating systems will make a great advance.

The rapid circulation heating system of the future will probably be designed on the following lines.

An apparatus will be built into the main pipe, containing at most a number of non-return valves and a diaphragm plate, but which will be able to take up the heat out of the hot water and, by means of this heat, effect the necessary circulation of the water. As, however, heat can only be gained by equalizing differences of temperature, the apparatus would have to be connected with a cooling arrangement, which could perhaps be built into the return pipe.

However, such a system of heating is not yet possible, and we are compelled to make use of steam for effecting the necessary work.

As the following description will make clear, we have at our service only steam at low pressure and in small quantity. We can, therefore, only make use of this steam to carry on the work required, by means of a steam cylinder of suitable design.

If we consider the well-known cylinders of a steam engine, we find that the steam engine cylinder must have a high efficiency and must be double acting. For our present purpose neither of these conditions is absolutely necessary. An apparatus which has less exacting conditions to fulfil can, as a rule, be more simply designed. The Turul steam cylinder is designed so that it will attain the highest degree of simplicity attainable while at the same time fulfilling all necessary conditions.

OPERATION OF THE TURUL STEAM CYLINDER

Fig. 1 represents this steam cylinder. The automatic valves s and p regulate the admission and exhaust of the steam. The cones of both valves close from below. The cone of the inlet vale p is so dimensioned that a moderate flow of steam slightly raises it to its seating, so that the valve closes of its own accord. The outflowing steam cannot close the exhaust valve s, but when the valve is once closed the steam holds the cone of the valve firmly in its seating.

When the piston r makes an upward stroke, the steam flows through the valve p into the cylinder, thus raising the piston. The exhaust valve s is kept closed during this time by the steam. When the steam has raised the piston so far that the spring t, on the cone of the exhaust-valve, reaches the boss u, and then the piston rises a little higher, the spring t is placed under tension. As soon as the tension of the spring is sufficient to overcome the pressure of the steam holding the valve cone, the latter is forced by the spring from its seating and the exhaust valve is opened. As now both valves are open the steam can flow freely through the cylinder. This lasts only a moment, however, since the steam closes the inlet valve before reaching any very considerable speed.

Since the exhaust valve is now open and the inlet valve shut, there is no pressure in the cylinder. The piston sinks by its own weight. As the piston approaches the bottom of the cylinder, the two valve cones touch first. The cone of the exhaust valve hangs loosely in its guides. The cone of the inlet valve is forced on to its seat by the pressure of the steam. The latter is, therefore, able to hold the weight of the cone of the exhaust valve. As soon as the piston has sunk so far that the seating of the exhaust valve touches the cone, the piston presses on the cone of the inlet valve. The steam pressure cannot resist this pressure and the piston opens the inlet valve. The steam now enters the cylinder under the piston and raises the piston once more.

A spiral tube which can easily be fitted in the hot water boiler suffices to supply the necessary steam. This spiral must be connected with a vessel which contains a certain amount of water. The remaining space in this vessel serves as a steam dome. With this steam raiser we can raise either high or low pressure steam. In the first case we shall need a feed pump or injector. In the case of low pressure steam, the water flows back into the boiler of its own accord. The desired simplicity of design will decide for the use of the low pressure system.

In low pressure steam heating the column of water standing in the return pipe above the water level of the boiler forms the counter pressure acting against the steam pressure. The higher this column can be, the higher the steam pressure can be. As higher steam pressure is preferable for our purposes, the highest possible pressure, depending on the height of the column will be chosen for each separate installation.

With low pressure heating systems, precautions must be taken so that the steam pressure cannot rise to such a height that the water is forced out of the boiler. This is generally prevented by the use of a stoking regulator. In the present case such regulation is not possible, since the heating spiral is in the hot water boiler, and in this case such a regulator is not desirable.

The highest admissible steam pressure can, however, be regulated by the consumption of steam. If we make suitable arrangements so that the consumption of steam increases with the pressure, the pressure will soon reach the highest possible point, since the steam raising spiral

can only raise a certain definite quantity of steam.

A steam cylinder may consume very different quantities of steam, since the number of strokes per minute are variable. If the steam pump works slowly, a very slight increase in the steam pressure can considerably raise its speed, under the condition that the resistance, which the pump has to overcome remains the same. The pump necessary for rapid circulation heating can thus, if suitably arranged, serve as a security against unduly high steam pressure.

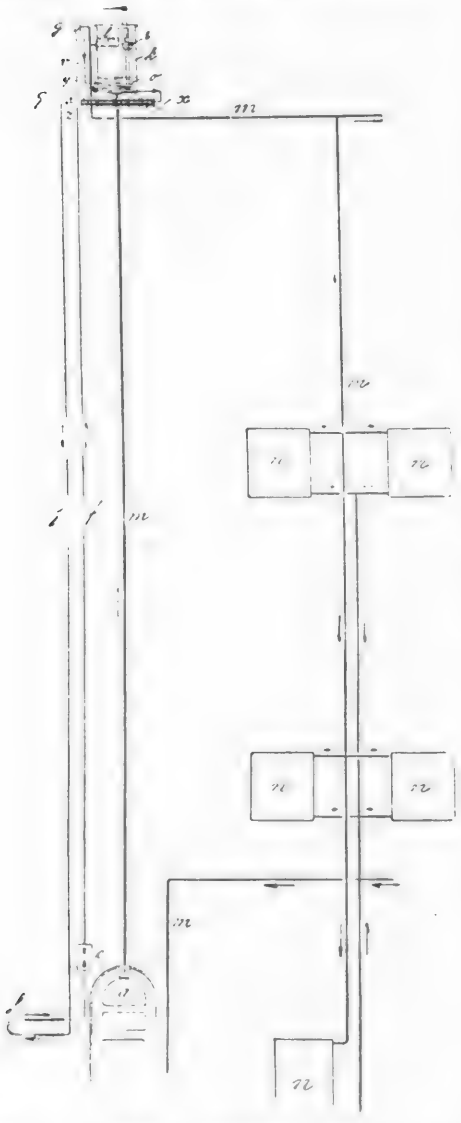


FIG. 2. TURUL HEATING INSTALLATION WITH INDEPENDENT STEAM RAISING AND WATER HEATING

The steam cylinder must be connected with an apparatus for raising the water. The design of this apparatus depends upon where the steam pump is to be located in the installation. The pump can be built into the main pipe or can be connected to the expansion chamber. If the pump is built into the main pipe, precautions must be taken to prevent an irregular circulation of the water, and the fact that the resistance of the installation can vary considerably as more or less of the radiators are shut off, must be taken into consideration. It would perhaps be possible to construct an apparatus which would fulfil these conditions.

The simplest solution of the problem, however, seems to be to connect the pump with the expansion chamber. If the water is raised from the expansion chamber into a vessel situated above it, from which latter vessel the water can flow through the installation back into the expansion chamber, we shall avoid all difficulties arising from the fitting of the pump in the main pipe. The steam for the pump can be raised independently of the hot water heating or the two can be combined. Either method should give satisfactory results.

Fig. 2 represents a Turul heating installation with independent steam raising and water heating; a is the water boiler, m the piping chamber, n the heater, and k the expansion chamber.

The latter contains the collecting chamber l and g is the steam cylinder described above. As may be seen from Figs. 1 and 2, the bucket i is alternatively raised and lowered by the piston by means of rods. At its lowest position the bucket dips into the water, the expansion chamber is filled and at its highest position empties the water into the chamber l, b is the heating spiral for raising the steam. This spiral is situated in the hot water boiler, c is the steam dome. The latter must be arranged so far above the heating spiral that the water in the latter circulates sufficiently rapidly.

The steam flows through the pipe f to the steam pump. The exhaust steam goes from the pump through the pipe v into the condensing spiral o. The latter is arranged above the bottom of the expansion chamber and is cooled by the water in the latter. As is well known, in a water cooled spiral tube a large amount of steam can be condensed, and this spiral does not need to be very long in order to condense the exhaust steam from the pump. As a security, for the possibility that the temperature of the water should become too high to condense the steam, the ripped pipe x is connected to the spiral. Any steam emerging from the spiral is condensed in this pipe. The condensed water flows through the pipe j back into the steam spiral.

The pipe z serves to ventilate the heating installation. The pipe q joins the expansion chamber, below the lowest water level with the pipe m, coming from the collecting chamber. A non-return valve is built into this pipe, the extremely light cone of this valve permitting water to flow from the expansion chamber into the main pipe, but not in the reverse direction.

HOW THE SYSTEM WORKS

The installation works as follows: As soon as the water boiler is fired the installation begins to work as an ordinary hot water heating plant. The water rises from the boiler into the expension chamber, from here it flows through the pipe q back into the main pipe and continues to flow through the piping until it returns to the boiler. This circulation has merely the object of preventing steam being raised in the boiler before the pump comes into action. If steam is formed the pressure raises the water in the condensor pipe. Since in high buildings the water can be raised to a height of 20 metres and more, we are in a position to raise high pressure steam by means of a low pressure system.

The bucket is always full when being raised so that the minimum steam pressure necessary to raise the piston is constant. As soon as this minimum pressure is reached, the pump begins to move slowly. The normal speed of the pump is from 10 to 15 strokes per minute. If the pressure rises 10 to 20% the speed of the pump is doubled. For this speed, however, double the normal amount of steam would be required.

Since the heating spiral is always in the heat of the boiler it is impossible for the steam pressure to rise much above the normal. A small increase in the speed of the pump is sufficient to prevent the pressure from exceeding the maximum admissible height. When the pump raises the water into the chamber l, the non-return valve y immediately closes, and the water flows through the high fall of the pipe, through the installation pipes back into the expansion chamber.

The second arrangement with steam raiser in connection with the water heater, which is in all other respects the same as the above, is represented in Fig. 3.

In this arrangement the spiral b connects the pipe c with the hot water heater. At the side of the steam pipe f is a second thin pipe w, connected to the first in several places. The exhaust steam from the pump flows through the pipe o into the expansion chamber. The steam collector c consists of a second pipe about 6 ft. 6 in. long. As soon as the boiler is fixed the water begins to circulate in the pipes f and w.

When as the temperature reaches 100° C. steam begins to form. The steam fills first the pipes f and w. The lower the steam forces the water the higher is the pressure. When the steam reaches the steam collector the pump begins to work.

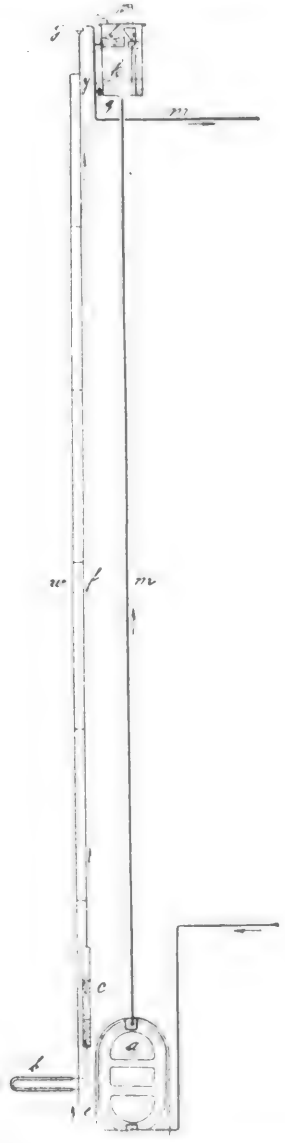


FIG. 3. ARRANGEMENT OF TURUL SYSTEM WITH STEAM RAISER IN CONNECTION WITH THE WATER HEATER

The pressure cannot now rise very much higher as with an increase of pressure the consumption of steam increases and this prevents the spiral from being emptied by too high pressure.

The exhaust steam from the pump is mixed in the expanding chamber with the water poured out of the bucket, and is thus quickly condensed. The condensed water is thus mixed with the water of the heating system and fresh water flows in

its place through the pipe e into the heating spiral.

In both arrangements it is to be noted that the amount of heat needed for the circulation is exceedingly small, since the exhaust from the pump helps to heat the water.

The pump has already been tested by the firm H. Wegener & Co. in Bremen, and works satisfactorily. The inventor of the Turul System, E. Segesváry, Waller Chaussée, Bremen, is planning to exploit his device in the United States.

Improving Heat Transmission in Waste Heat Air Heaters

Most engineering operations involve the transfer of heat between metal surfaces and fluids. Such transfer is involved in the operation of steam boilers, closed feed water heaters, heating coils and radiators, economizers, condensers, evaporators, cooking kettles, etc. The rate of heat transference attainable obviously influences the design of these several apparatuses to a marked degree.

This rate may be expressed commercially as the number of B. T. U. transferred per square foot of heating surface per hour per degree difference of temperature and is usually designated by U. The magnitude of U is obviously affected by the following factors: First, the temperature, nature and condition of motion of the medium from which the heat is being transmitted; second, the thickness, material and condition of the intervening plate or tube surface; and third, the temperature, nature and condition of motion of the fluid which is being heated. How great the influence of these several factors is upon the activity of the heat transmitting surface will be apparent from an approximate statement of the values obtained in several different kinds of apparatus.

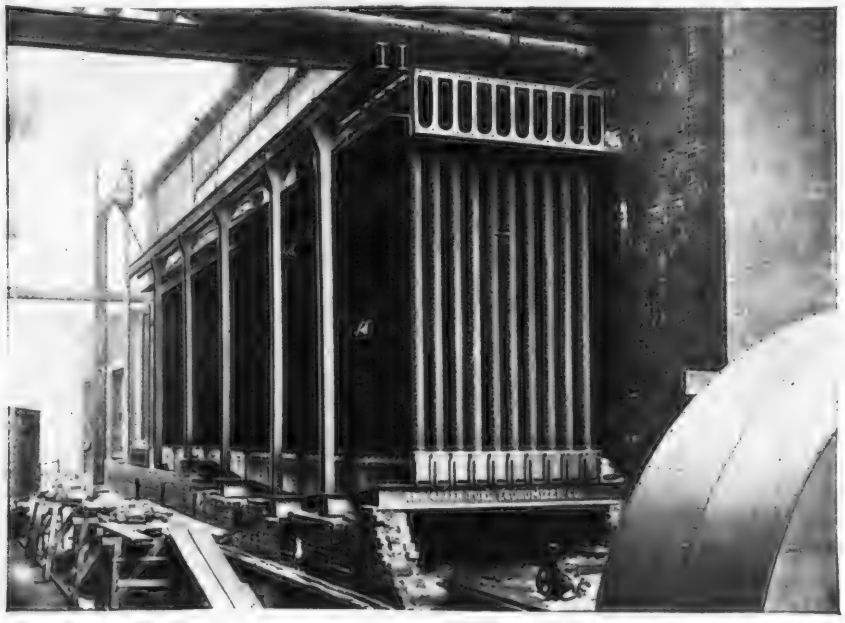
For boilers and economizers the value of U appears to vary between 2 and 3½ heat units per square foot per hour per degree difference of temperature. In heat exchangers, that is, appliances in which heat is transferred from one liquid to another through a metal surface, values of 50 to 60 are given for U. In closed feed water heaters, it is usually between 200 and 300, while in certain modern types of surface condensers values approaching 1,000 are being obtained. Such a wide range of values cannot but cause the engineer to ask whether or not the performance of any one particular type of the apparatus is at the maximum possible or can be improved by changes in design or in methods of operation. In this article we shall describe some experiments made with this point in view upon the Green waste heat air heater, a device for heating air directly from gases of combustion and similar in its general arrangement to the Green fuel economizer.

It should be noted that whether air be heated in this device or by the ordinary means of steam coils, the source of the heat and its final destination are the same in each case. Where steam is used, the heat is first transmitted from hot gases of combination to the metal of the boiler, thence to the water and steam in the boiler and again from the water or steam to the metal of the heating coil or radiator and finally to the air. In the present device the heat is transmitted from hot gases to the walls of the metal pipes and from these immediately to the air. With the same difference in temperature between the hot gases of combustion and the air, the capacity of the waste heat air heater would undoubtedly be greater than the capacity of twice the amount of combined boiler surface and radiator surface, other conditions being equal. However, the heater is more usually employed for recovering heat from gases of combustion after the latter have already done service in a steam boiler or other apparatus. That is, the heater is usually employed as a means of fuel economy, saving the waste heat that would otherwise escape through the chimney to atmosphere and applying it to purposes for which steam would otherwise be required or using it to preheat the air supplied to the furnace, thus increasing the temperature and efficiency of the latter.

In consequence of receiving gases at a lower temperature, the total amount of heat transmitted per square foot of surface is usually not as great as in a boiler although the activity of the surface as measured by the number of heat units transferred per square foot per hour per degree difference of temperature is geater, particularly when the apparatus is operated with the special appliances herein described. As compared with a steam heater coil or radiator, the activity of the waste heat air heater is comparatively high due to the greater range of temperature, for while an exhaust steam heated radiator will rarely have a temperature much higher than 212° to 220° F. or a live steam heated radiator higher than 400° F., the waste heat air heater may be receiving gases of a temperature of 1,000° F., or higher, as for instance, the stack valve gases of water gas generators or the waste gases from metal furnaces. When the apparatus is installed to receive the chimney flue gases from a steam boiler the temperature will as a rule be between 500° and 650° F. The final temperature of the air heated by the apparatus will be determined by the use that is to be made of it. For heating and ventilating rooms in buildings this will be quite moderate, while for drying work it will be limited as a rule, by the nature of the material

being dried, although temperatures above 500° or 600° F. are sometimes employed.

The apparatus can be so connected up that the air will be passed through all the pipes in parallel or through groups placed in series. In the latter case it is customary to have the air enter the apparatus at the cold end, that is the end from which the gases of combustion are leaving, and to leave the apparatus from the hot end, that is, the end with which the gases of combustion first come in contact, as by this means the greatest average difference in temperature is maintained throughout the apparatus. A perfect apparatus arranged in this way



GREEN WASTE HEAT AIR HEATER FOR DRYING WORK
600 PIPES ARRANGED IN THREE PASSES

would be able to transfer all the heat of the hot gases to the cold gases. In making arrangements of this kind it was discovered that if the same number of cubic feet of air were put through the heater with one half of the pipes arranged in series with the other half, the amount of heat transmitted per square foot of surface per hour per degree difference of temperature was increased 50% to 75%. This confirms results obtained by the engineers of the United States Geological Survey and by other investigators upon steam boilers. It appears that the transfer of heat to and from a gas is almost entirely by convection, so that anything that is done to increase the commotion or to increase the rate at which the cold gas is removed from the surface and hot gas substituted will increase the rate of heat transmission. If motion is not given to the gas mechanically or by natural gravity circulation, the transfer of heat can only take place by diffusion which may be conceived of as a process of gas molecules receiving high velocity from the hot plate and expending it upon slower moving molecules a little distance away from the plate, these in turn passing it on to others. The transfer of heat through gases by diffusion is an exceedingly slow process, as witness the many engineering appliances in which heat insulation is secured by means of "dead air" spaces.

The success obtained from merely increasing the velocity of the air blowing through the pipe naturally led to the suggestion that the rate of heat transference could be still more increased if the air were churned up and the cold core gas in the center of the pipe brought more positively into contact with the walls. To this end, specially designed "winged" spirals were inserted in the pipe, with results wholly justifying the reasoning, for the rate of heat transfer was increased in about the same ratio as by doubling the velocity of the air.

The results of these experiments are shown in the several curves in the diagram, where Curve 1 shows the heat transmitted per square foot per hour per degree difference of temperature for various numbers of cubic feet of air passed through the heater per minute. Curve 2 shows the same values for the same heater with the same volume of air passed first through one-half and then through the other half of the tubes in series. Curve 3 shows the values obtained by passing the air through all the

tubes in parallel but with winged spirals in the tubes, while Curve 4 shows the values obtained with the spirals and the two groups of tubes in series. Curve 1 in this diagram is especially interesting since it is nearly a straght line, showing that the rate of heat transmssion increases almost directly as the velocity of

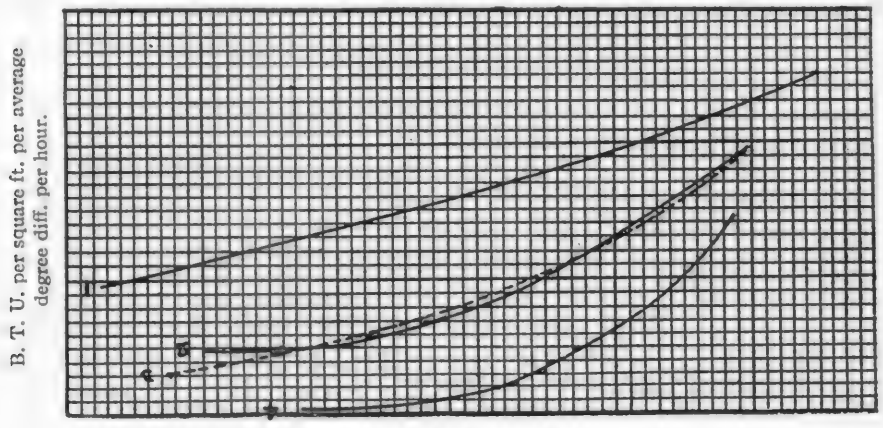


CHART SHOWING RESULTS OF EXPERIMENTS WITH GREEN WASTE HEAT AIR HEATER

the air, a result which had already been demonstrated by the United States Geological Survey. In all these experiments the exteriors of the pipes were kept free of soot by means of automatic scrapers similar to those used on the economizer.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CAR VENTILATION

Results of a Study of Car Ventilation in Chicago. Gives ventilation experiments made by J. F. Biehn and J. B. Gooken, with brief descriptions of systems tested and results. 3,500 w. Elec Ry Jour—May 8, 1909. 20c.

CENTRAL PLANTS

Central Heating and Lighting Plant for the United States Military Academy. Henry C. Meyer, Jr. Plan and illustrated description of the plant at West Point to serve a group of buildings. 4,500 w. Eng Rec—May 1, 1909. Serial, 1st part. May 8, 1909. Serial, 2d part. 20c. each.

London Municipal Heat Supply. Alfred E. Wheeler. Discusses the advantages of central station heat generation, especially its relation to the prevention of smoke. 3,000 w. Archt, Lond—June 4, 1909. Serial. 1st part. 40c.

HEATING

Notes on Radiators. Gives tabulated results of experiments to determine the efficiency, with related information. 1,800 w. Elec Rev, Lond—May 7, 1909. 40c.

HEATING SYSTEMS

A Few Principles for Heating Buildings. R. W. Kings. 6,000 w. Con Rec—May 12, 1909. 20c.

POWER PLANTS

Mechanical Equipment of the Plaza Hotel. Warren O. Rogers. 3,000 w. Power—May 18, 1909. 20c.

Power Plant of the Cleveland Arcade. H. W. Woodward. Illustrates and describes the method of solving a difficult problem in power plant design. 3,500 w. Ind Engng—May, 1909. 40c.

CHOICE OF HEATING EQUIPMENT

Choice of Heating Equipment. G. W. Stanton. Description of various types of heating systems, with special reference to vacuum and forced hot water systems. 3,500 w. Eng Mag—July, 1909. 30c.

HOSPITALS

Warming and Ventilating with Special Reference to Hospital Buildings. D. D. Kimball. Reviews the history and development of the principles of ventilation, explaining methods of warming and ventilating hospitals. 3,500 w. Br Build—May, 1909. Serial. 1st part. 60c.

SHOP COOLING

The Cooling of Factories by the Evaporation of water (Refraichissement des Locaur industriels par Evaporation d'Eau). A. Papin. Describes methods and apparatus. Ills. 5,500 w. Génie Civil—May 1, 1909. 60c.

MECHANICAL PLANTS

The Cleveland Technical High School. H. W. Woodward. Illustrated description of the heating, lighting, power and ventilating systems. 3,000 w. Power—June 1, 1909. 20c.

PEAT

Fuel from Peat. Dr. M. Ekenberg. Read before the I. and S. Inst. Researches and experiments with the object of finding a suitable process for converting peat into fuel without air-drying. Ills. 8,500 w. Ir & Coal Trds Rev—May 14, 1909. 40c.

The Weather for June

June, 1909, was a normal month, as regards the weather, the mean temperature being close to or slightly above the average.

NEW YORK

Highest temperature, 92° on the 25th; lowest temperature, 53° on the 19th; greatest daily range, 24° on the 25th; least daily range, 3° on the 9th. Mean temperature for the month, 70°, 1° above the mean of this month for 39 years. Total rainfall, 3.17 in., very near the normal. Total wind movement, 7,014 miles, mostly from the southwest.

BOSTON

Highest temperature, 94° on the 25th; lowest temperature, 49° on the 9th; greatest daily range, 26° on the 3rd; least daily range, 3° on the 10th. Mean temperature for the month, 69°, 3° above the mean of this month for 39 years. Total rainfall, 4.45 in., nearly 1½ in. more than usual. Total wind movement 7,121 miles, mostly from the west.

PITTSBURG

Highest temperature, 88° on the 27th; lowest temperature, 50° on the 19th; greatest daily range, 29° on the 20th; least daily range, 9° on the 22nd. Mean temperature for the month, 71°, corresponding to the mean of this month for 39 years. Total rainfall, 4.92 in., 1¼ in. more than usual. Total wind movement, 5,117 miles, mostly from the southwest.

CHICAGO

Highest temperature, 87° on the 22nd; lowest temperature, 48° on the 15th; greatest daily range, 23° on the 20th; least daily range, 4° on the 8th. Mean temperature for the month, 67°, 6° above the mean of this month for 39 years. Total rainfall, 5.09 in., 1½ in. more than usual. Total wind movement 8,006 miles, mostly from the northwest.

ST. LOUIS

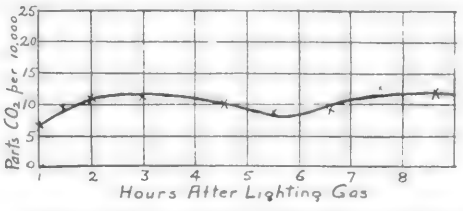
Highest temperature, 92° on the 27th; lowest temperature, 57° on the 18th; greatest daily range, 23° on the 25th; least daily range, 7° on the 10th. Mean temperature for the month, 75°, corresponding to the mean of this month for 37 years. Total rainfall, 2.63 in., nearly 2 in. less than usual. Total wind movement, 6,059 miles, mostly from the southwest.

Influence of Exercise on the Vitiation of Air

It has been said that a horse is about eight times as powerful as a man, and again it has been estimated that an athlete in a short sprint or in a foot-ball game develops for a short period energy at the rate of the so-called horse power. When thus exerting himself to the utmost a man breathes rapidly and deeply, requiring large volumes of oxygen.

On the other hand, while resting quietly or while asleep, the respiration is such that comparatively little oxygen is needed. Midway between these extremes is the moderately active person, moving about in the performance of ordinary duties.

The above conditions have their effects on ventilation, for the extent to which the air is vitiated is directly proportioned to the carbonic acid gas exhaled, which in turn is proportional to the air breathed. To determine the vitiation of

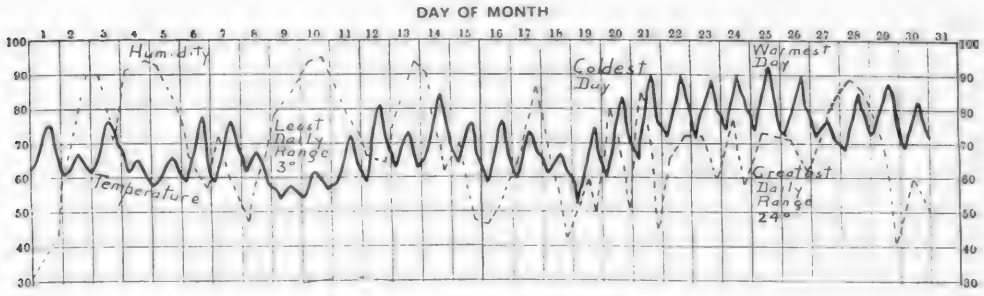


CHANGE IN CARBON DIOXIDE IN ROOM AFTER LIGHTING GAS

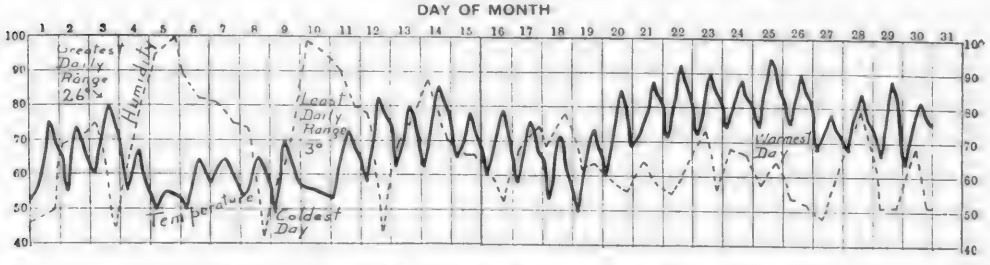
air due to the presence of a man in a room with a gas jet burning, experiments were recently made by the Arthur D. Little, Inc., Laboratory of Engineering Chemistry, Boston, Mass., the results being shown by the accompanying curve.

This curve is interpreted to mean that the percentage of carboric acid gas exhaled varied with the acitvity of the man, the gas jet requiring a constant quantity of oxygen. During the first three hours the man moved about moderately, rested, and finally fell asleep. The change in the curve indicates that for the two hours (approx.) he was asleep, the vitiation was greatly reduced but increased again when he wakened and moved about.

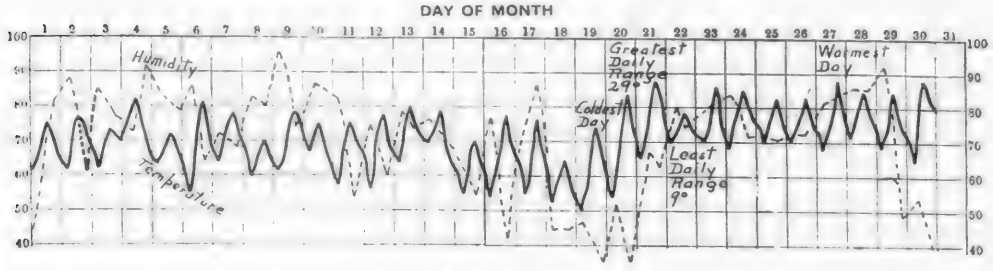
The observations made during the tests proved also that an active man uses up the oxygen in air at about the same rate as does a gas jet burning 5 cu. ft. of gas per hour, the capacity of the ordinary burner.



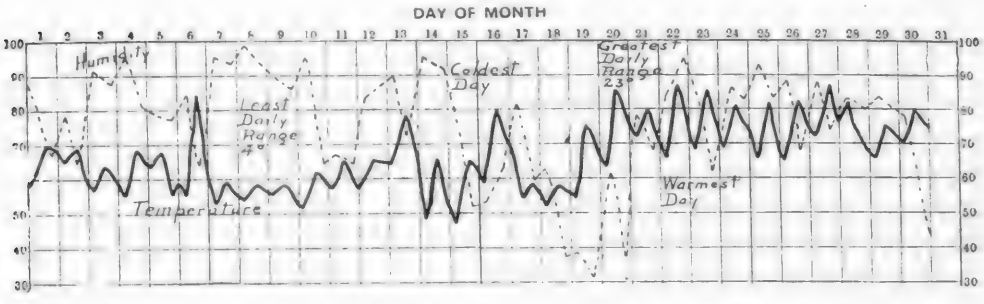
RECORD OF WEATHER IN NEW YORK FOR JUNE, 1909



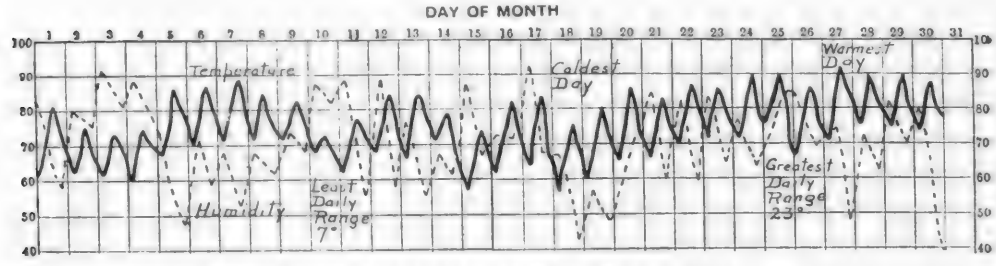
RECORD OF WEATHER IN BOSTON FOR JUNE, 1909



RECORD OF WEATHER IN PITTSBURG FOR JUNE, 1909



RECORD OF WEATHER IN CHICAGO FOR JUNE, 1909



RECORD OF WEATHER IN ST. LOUIS FOR JUNE, 1909

$6,500,000 Merchants' and Manufacturers' Exchange Buildings for New York

Two commercial buildings, covering the entire blocks from Forty-sixth to Forty-eighth streets, Lexington avenue to Depew Place, New York, are about to be built by the Merchants' and Manufacturers' Exchange of New York, to be used as a market for the merchants and buyers of this and other countries. There will be approximately 30 acres of floor space, all of which will be utilized for the salesrooms of manufacturers and so arranged to enable visiting buyers to inspect the product of hundreds of factories in a minimum of time and with a maximum of comfort and convenience.

TWIN BUILDINGS OF THE MERCHANTS' AND MANUFACTURERS' EXCHANGE, BEING ERECTED AT LEXINGTON AVENUE AND DEPEW PLACE, 46th TO 48th STREETS, NEW YORK

The buildings will be 12 stories each and are, in fact, part of the new $20,000,000 Grand Central Station. They will be built by the New York Central and the New York, New Haven and Hartford Railroads for the Merchants' and Manufacturers' Exchange.

Among the comforts and conveniences to be provided will be a well-appointed club, including reading, writing and private rooms, and a roof garden restaurant for the entertainment of visiting buyers. The three lower floors of one building will be devoted to an assembly hall for trade conventions requiring a large area for the display of goods, machinery, etc., of each trade at the time of each convention.

The directorate of the Exchange includes E. P. V. Ritter, of the Nicholls-Ritter Realty and Financial Co., New York; George C. Smith, of the Westinghouse Companies, and the Carnegie Trust Co. and other financial institutions of New York; Alexander M. Stewart, James Stewart & Co., and the Stewart-Kerbaugh-Shanley Co., engineers and contractors; Liston L. Lewis, Keener & Lewis, attorneys at law, and Charles E. Spratt, of the New York Furniture Exchange, who will be the general manager.

Ability of Sheet Metal Radiators to Withstand Freezing

The danger of freezing in a hot water heating system has long been regarded as one of the strongest objections that could be raised to this method of warming, especially for an isolated building. As far as the radiators are concerned, however, this danger would seem to be obviated in cases where sheet metal radiators are used. A correspondent in Glens Falls, New York, writing to the Pressed Radiator Company of America on this subject, says:

"Your circular entitled 'A Response to the Principal Arguments Advanced Against Pressed Radiators' reminds us of the experience of one of our customers during the past winter, that may be of interest to you.

"We were the people to introduce pressed radiators in this section. We met with considerable opposition but we used them in quite a number of jobs. Late last fall the occupants of one residence moved out. The owners of the property are in the mill business here and sent one of their men to turn off the water. He failed to drain out any of the fixtures or the hot water

heating apparatus, all of which stood full of water throughout the winter. In March the owners discovered the condition and called on us to ascertain and repair the damage.

"We found that the cast iron sectional hot water heater was practically destroyed; much of the pipe work was split, and nearly all the radiators showed bulges. We thawed them out as carefully as possible and were able to re-set every one of the radiators in the house. In a few instances we had to reverse the ends so as to turn the bulge to the wall, but, so far as we can see, the radiators are all serviceable, and as they set show no ill effect of the freezing. If they had been cast-iron radiators every radiator section in the house would have been broken. We regard this as quite a feather in your cap."

CORRESPONDENCE

Words of Encouragement

Editor HEATING AND VENTILATING MAGAZINE:

I wish to congratulate you on your magazine, as you have succeeded in making it quite an interesting and instructive journal. I hope that it will see many other Five Year anniversaries.

HARRIE D. CRANE.

Cincinnati, June, 1909.

American Exposition in Berlin

An American exposition will be held in Berlin, Germany, during April, May and June, 1910. The enterprise is intended to educate the Europeans, especially the German population, to the importance and excellence of American manufactured products. The well-known Exposition Palace, near the Zoological Gardens, has been secured for the exposition and it is announced that the Hamburg-American and German Lloyd lines have granted a reduction of 20% in the freight charges on exhibits both ways. The address of the American headquarters is Hudson Terminal Buildings, 50 Church street, New York, Max Vieweger, manager. The exposition managers have issued a handsome circular giving full information regarding the forthcoming exposition.

New Book

Mechanics' and Materialmen's Lien Laws of the Southeastern States, including Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Virginia, with the act of Congress of 1905, is a new book by Henry A. Alexander, of the Atlanta bar. The author includes abstracts of the decisions of the State and Federal courts on this subject. The book is published at $6.00 by the Southeastern Publishing Co., Atlanta, Ga.

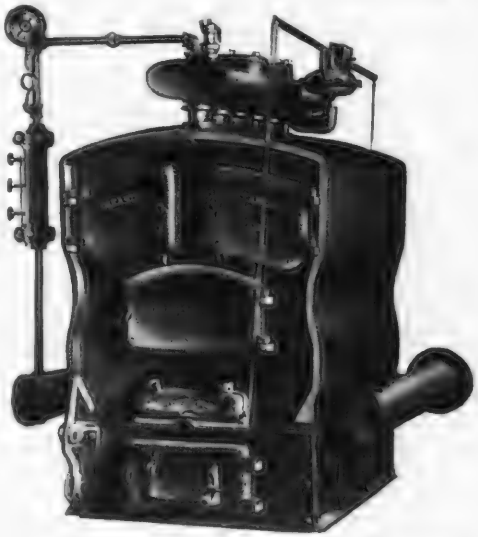
Heard at the Heating Engineers' Summer Meeting

The summer meeting of the American Society of Heating and Ventilating Engineers provided the opportunity, which was taken advantage of, for discussing the welfare of the organization in general and the approaching election of officers, for which a ballot is sent out in advance of the annual meeting. "It was peculiarly fortunate," said one of the prominent members present "that the society held its summer meeting in Indianapolis this year, as it gave Prof. James D. Hoffman, of the local entertainment committee, an opportunity to serve the society, which he did in an able and efficient manner.

"Prof. Hoffman having previously served the society as its first vice-president, the general impression of the local and western members is that he should be elected to the presidency at the coming annual meeting. We think he is the logical candidate and would handle the affairs of the society in a creditable manner, worthy of its increasing importance and membership."

A New "American" Boiler

The announcement of the manufacture of a new boiler by such an old, reliable house as Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., is an item that is



SECTIONAL VIEW OF NEW AMERICAN BOILER

of interest to everyone in the heating and ventilating trade. This firm announces that they are now in position to make

shipment of their new "American" boiler for steam and hot water. It is made in five series of thirty-one sizes for both steam and hot water.

The accompanying illustration shows a sectional view of the new No. S-266 "American," and in the advertisement of the Pierce, Butler & Pierce Mfg. Co. in this issue is shown an external view of the No. S-326 "American" boiler. The Pierce, Butler & Pierce Mfg. Co. has issued a new catalogue describing this new boiler and will send it to any one interested in having the latest pattern of sectional boiler.

Trade Literature

Zellweger Air Washing and Cooling Fan, made by J. Zellweger & Sons, St. Louis, Mo., is a new interesting device described in a circular issued by the makers. In its construction the filter bed is attached to the blades of the fan which are similar to the Sirocco type, and the sprays are located within the fan wheel. The circulation of the water is maintained by centrifugal action.

Sparks-Eddins System of Vacuum Heating is the title of a catalogue, describing a new automatic system of vacuum heating owned by the Automatic Vacuum Pump Co., St. Louis, Mo. The pump used is designed to pump both the air and the condensed steam from the system. The apparatus is described as the only one that can be applied to old as well as to new one-pipe (with air line) heating systems, even where the old system is not tight. The pump is controlled by the vacuum and operates whenever necessary to keep the system free from cold air. In addition to the catalogue, the company issues a comparative table, giving the results with and without the Sparks-Eddins system, showing a saving with the system of from 30% to 50% in the pounds of coal consumed per 1,000 sq. ft. per day and in the pounds of coal consumed per square foot of radiation per day.

Warm Air for Kelsey Dealers is a new house organ, Vol. 1, No. 1, being dated June, 1909. It is a 12-page publication, 4¾ in. x 7 in., published by the Kelsey Heating Co., Syracuse, N. Y., and the first number includes much interesting reading matter upon the topics of "Reaching Home Builders," "Installation Problems," "Selling Points," "Kelsey Advertising," "The Show Window," "Following Up Prospects," concluding with a readable article on "The Exclusive Agent."

Model Boiler and Radiator is the subject of a handsome new catalogue issued by the Model Heating Co., Philadelphia, in which this well-known type of heater is taken up in detail and described with broken photographic views showing the various details of construction. Special attention is called to the tongue construction of the intermediate sections which is the distinguishing feature of the Model boiler, and to the clinker proof grates, which are triangular in form with three bearing surfaces. Among the views is one showing the economy of space and ease of management made possible through the compactness of the Model type of heater. Dimensions and tappings are given for heaters ranging from 207 to 5,020 sq. ft. steam radiating surface and from 344 to 8,347 sq. ft. water radiating surface. An important section of the catalogue is devoted to the company's full line of radiators while another section describes the Model small water heaters. A special note states that the Model heater is rated on the basis of coal consumed per square foot of grate per hour and the efficiency of the boiler, in acordance with the resolution adopted by the American Society of Heating and Ventilating Engineers. Size 6x9 in. Pp. 24.

Foxboro Recorder for July, 1909, published by the Industrial Instrument Co., Foxboro, Mass., contains illustrated descriptions of the company's line of tachometers for testing, decimal dial electric clocks and secondary clocks; together with gauges for various purposes.

Scientific Ventilation is the title of a newly-issued circular published by the Spaulding & Pryor Co., New York, in which is described a new ozone ventilating device, the invention of Charles G. Armstrong, consulting engineer, New York. The company has lately engaged in the manufacture of these devices on an extensive scale.

Leak-No Metallic Compound, made by the H. W. Johns-Manville Co., New York, is the subject of a new leaflet, showing the application of this compound in repairing leaks in anything made of iron and steel. The illustrations show the compound being applied to radiators, boilers, valves, pump cylinders, etc. The H-O pipe joint cement is also brought to the attention of the trade in the circular.

Two Sides of the Story of the Central Power and Heating Plant, illustrating the advantages, by comparative views, of the J-M sectional pipe conduit over other pipe coverings, is the title of a new circular, published by the H. W. Johns-Manville Co., New York. The circular includes many photographic reproductions of actual installations illustrating the points made and figures are presented regarding three types of underground steam systems on a basis of 500 ft. of 6-in. steam mains, with 3-in. returns, from which a saving is shown in favor of the J-M conduits of 82% over wood covering and 44% over brick or concrete. The company states that over 150,000 ft. of J-M sectional conduits has been installed without one complaint.

THE HEATING AND VENTILATING MAGAZINE

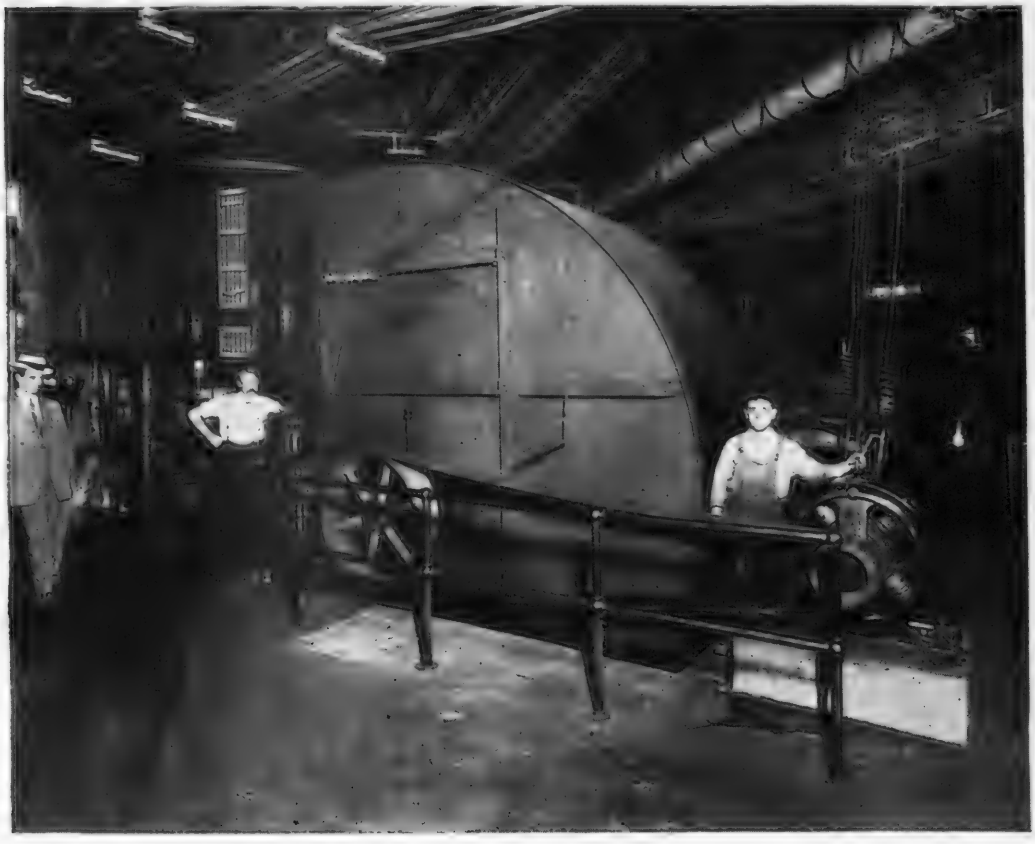
1123 BROADWAY NEW YORK SEPTEMBER, 1909

Use of Ozone Generators in the Ventilation of Buildings

Installation in the Chicago Public Library

For some weeks past a test of great importance has been made in adapting ozone generators to ventilating systems in large buildings. This demonstration is unique in so far that it is the first actual ozone apparatus installed in a large air duct—used wholly to convey fresh air to various rooms in a large building.

The test above referred to, started the first of August and has been in continued operation ever since. In selecting the Chicago Public Library building for this test, the National Air

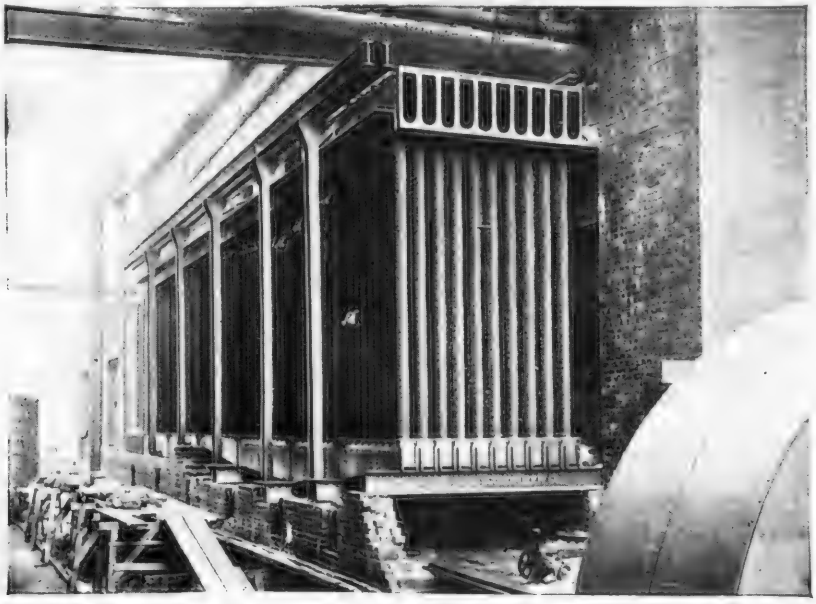


VIEW OF BLOWER, CHICAGO PUBLIC LIBRARY, SHOWING INSTALLATION OF OZONE GENERATOR

being dried, although temperatures above 500° or 600° F. are sometimes employed.

The apparatus can be so connected up that the air will be passed through all the pipes in parallel or through groups placed in series. In the latter case it is customary to have the air enter the apparatus at the cold end, that is the end from which the gases of combustion are leaving, and to leave the apparatus from the hot end, that is, the end with which the gases of combustion first come in contact, as by this means the greatest average difference in temperature is maintained throughout the apparatus. A perfect apparatus arranged in this way would be able to transfer all the heat of the hot gases to the cold gases. In making arrangements of this kind it was discovered that if the same number of cubic feet of air were put through the heater with one half of the pipes arranged in series with the other half, the amount of heat transmitted per square foot of surface per hour per degree difference of temperature was increased 50% to 75%. This confirms results obtained by the engineers of the United States Geological Survey and by other investigators upon steam boilers. It appears that the transfer of heat to and from a gas is almost entirely by convection, so that anything that is done to increase the commotion or to increase the rate at which the cold gas is removed from the surface and hot gas substituted will increase the rate of heat transmission. If motion is not given to the gas mechanically or by natural gravity circulation, the transfer of heat can only take place by diffusion which may be conceived of as a process of gas molecules receiving high velocity from the hot plate and expending it upon slower moving molecules a little distance away from the plate, these in turn passing it on to others. The transfer of heat through gases by diffusion is an exceedingly slow process, as witness the many engineering appliances in which heat insulation is secured by means of "dead air" spaces.

The success obtained from merely increasing the velocity of the air blowing through the pipe naturally led to the suggestion that the rate of heat transference could be still more increased if the air were churned up and the cold core gas in the center of the pipe brought more positively into contact with the walls. To this end, specially designed "winged" spirals were inserted in the pipe, with results wholly justifying the reasoning, for the rate of heat transfer was increased in about the same ratio as by doubling the velocity of the air.



GREEN WASTE HEAT AIR HEATER FOR DRYING WORK
600 PIPES ARRANGED IN THREE PASSES

The results of these experiments are shown in the several curves in the diagram, where Curve 1 shows the heat transmitted per square foot per hour per degree difference of temperature for various numbers of cubic feet of air passed through the heater per minute. Curve 2 shows the same values for the same heater with the same volume of air passed first through one-half and then through the other half of the tubes in series. Curve 3 shows the values obtained by passing the air through all the

tubes in parallel but with winged spirals in the tubes, while Curve 4 shows the values obtained with the spirals and the two groups of tubes in series. Curve 1 in this diagram is especially interesting since it is nearly a straght line, showing that the rate of heat transmssion increases almost directly as the velocity of

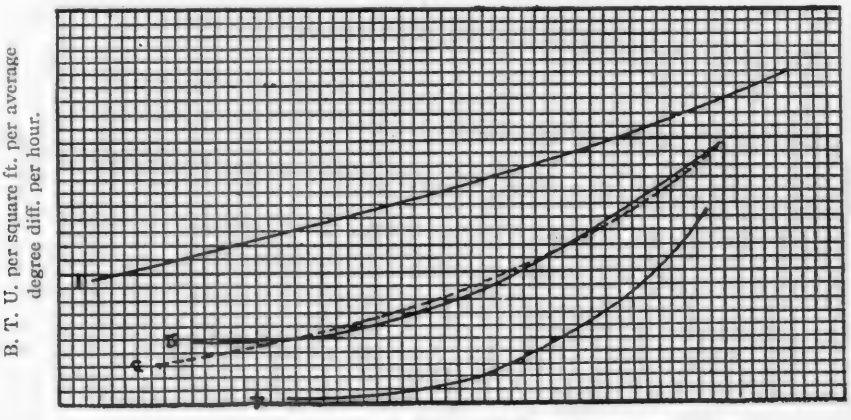


CHART SHOWING RESULTS OF EXPERIMENTS WITH GREEN WASTE HEAT AIR HEATER

the air, a result which had already been demonstrated by the United States Geological Survey. In all these experiments the exteriors of the pipes were kept free of soot by means of automatic scrapers similar to those used on the economizer.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CAR VENTILATION

Results of a Study of Car Ventilation in Chicago. Gives ventilation experiments made by J. F. Biehn and J. B. Gooken, with brief descriptions of systems tested and results. 3,500 w. Elec Ry Jour—May 8, 1909. 20c.

CENTRAL PLANTS

Central Heating and Lighting Plant for the United States Military Academy. Henry C. Meyer, Jr. Plan and illustrated description of the plant at West Point to serve a group of buildings. 4,500 w. Eng Rec—May 1, 1909. Serial, 1st part. May 8, 1909. Serial, 2d part. 20c. each.

London Municipal Heat Supply. Alfred E. Wheeler. Discusses the advantages of central station heat generation, especially its relation to the prevention of smoke. 3,000 w. Archt, Lond—June 4, 1909. Serial. 1st part. 40c.

HEATING

Notes on Radiators. Gives tabulated results of experiments to determine the efficiency, with related information. 1,800 w. Elec Rev, Lond—May 7, 1909. 40c.

HEATING SYSTEMS

A Few Principles for Heating Buildings. R. W. Kings. 6,000 w. Con Rec—May 12, 1909. 20c.

POWER PLANTS

Mechanical Equipment of the Plaza Hotel. Warren O. Rogers. 3,000 w. Power—May 18, 1909. 20c.

Power Plant of the Cleveland Arcade. H. W. Woodward. Illustrates and describes the method of solving a difficult problem in power plant design. 3,500 w. Ind Engng—May, 1909. 40c.

CHOICE OF HEATING EQUIPMENT

Choice of Heating Equipment. G. W. Stanton. Description of various types of heating systems, with special reference to vacuum and forced hot water systems. 3,500 w. Eng Mag—July, 1909. 30c.

HOSPITALS

Warming and Ventilating with Special Reference to Hospital Buildings. D. D. Kimball. Reviews the history and development of the principles of ventilation, explaining methods of warming and ventilating hospitals. 3,500 w. Br Build—May, 1909. Serial. 1st part. 60c.

SHOP COOLING

The Cooling of Factories by the Evaporation of water (Refraichissement des Locaur industriels par Evaporation d'Eau). A. Papin. Describes methods and apparatus. Ills. 5,500 w. Génie Civil—May 1, 1909. 60c.

MECHANICAL PLANTS

The Cleveland Technical High School. H. W. Woodward. Illustrated description of the heating, lighting, power and ventilating systems. 3,000 w. Power—June 1, 1909. 20c.

PEAT

Fuel from Peat. Dr. M. Ekenberg. Read before the I. and S. Inst. Researches and experiments with the object of finding a suitable process for converting peat into fuel without air-drying. Ills. 8,500 w. Ir & Coal Trds Rev—May 14, 1909. 40c.

The Weather for June

June, 1909, was a normal month, as regards the weather, the mean temperature being close to or slightly above the average.

NEW YORK

Highest temperature, 92° on the 25th; lowest temperature, 53° on the 19th; greatest daily range, 24° on the 25th; least daily range, 3° on the 9th. Mean temperature for the month, 70°, 1° above the mean of this month for 39 years. Total rainfall, 3.17 in., very near the normal. Total wind movement, 7,014 miles, mostly from the southwest.

BOSTON

Highest temperature, 94° on the 25th; lowest temperature, 49° on the 9th; greatest daily range, 26° on the 3rd; least daily range, 3° on the 10th. Mean temperature for the month, 69°, 3° above the mean of this month for 39 years. Total rainfall, 4.45 in., nearly 1½ in. more than usual. Total wind movement 7,121 miles, mostly from the west.

PITTSBURG

Highest temperature, 88° on the 27th; lowest temperature, 50° on the 19th; greatest daily range, 29° on the 20th; least daily range, 9° on the 22nd. Mean temperature for the month, 71°, corresponding to the mean of this month for 39 years. Total rainfall, 4.92 in., 1¼ in. more than usual. Total wind movement, 5,117 miles, mostly from the southwest.

CHICAGO

Highest temperature, 87° on the 22nd; lowest temperature, 48° on the 15th; greatest daily range, 23° on the 20th; least daily range, 4° on the 8th. Mean temperature for the month, 67°, 6° above the mean of this month for 39 years. Total rainfall, 5.09 in., 1½ in. more than usual. Total wind movement 8,006 miles, mostly from the northwest.

ST. LOUIS

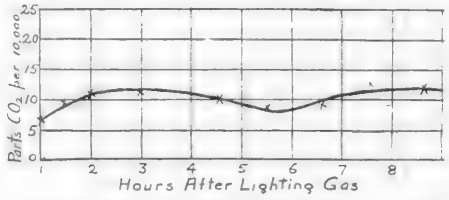
Highest temperature, 92° on the 27th; lowest temperature, 57° on the 18th; greatest daily range, 23° on the 25th; least daily range, 7° on the 10th. Mean temperature for the month, 75°, corresponding to the mean of this month for 37 years. Total rainfall, 2.63 in., nearly 2 in. less than usual. Total wind movement, 6,059 miles, mostly from the southwest.

Influence of Exercise on the Vitiation of Air

It has been said that a horse is about eight times as powerful as a man, and again it has been estimated that an athlete in a short sprint or in a foot-ball game develops for a short period energy at the rate of the so-called horse power. When thus exerting himself to the utmost a man breathes rapidly and deeply, requiring large volumes of oxygen.

On the other hand, while resting quietly or while asleep, the respiration is such that comparatively little oxygen is needed. Midway between these extremes is the moderately active person, moving about in the performance of ordinary duties.

The above conditions have their effects on ventilation, for the extent to which the air is vitiated is directly proportioned to the carbonic acid gas exhaled, which in turn is proportional to the air breathed. To determine the vitiation of



CHANGE IN CARBON DIOXIDE IN ROOM AFTER LIGHTING GAS

air due to the presence of a man in a room with a gas jet burning, experiments were recently made by the Arthur D. Little, Inc., Laboratory of Engineering Chemistry, Boston, Mass., the results being shown by the accompanying curve.

This curve is interpreted to mean that the percentage of carboric acid gas exhaled varied with the acitvity of the man, the gas jet requiring a constant quantity of oxygen. During the first three hours the man moved about moderately, rested, and finally fell asleep. The change in the curve indicates that for the two hours (approx.) he was asleep, the vitiation was greatly reduced but increased again when he wakened and moved about.

The observations made during the tests proved also that an active man uses up the oxygen in air at about the same rate as does a gas jet burning 5 cu. ft. of gas per hour, the capacity of the ordinary burner.

heating apparatus, all of which stood full of water throughout the winter. In March the owners discovered the condition and called on us to ascertain and repair the damage.

"We found that the cast iron sectional hot water heater was practically destroyed; much of the pipe work was split, and nearly all the radiators showed bulges. We thawed them out as carefully as possible and were able to re-set every one of the radiators in the house. In a few instances we had to reverse the ends so as to turn the bulge to the wall, but, so far as we can see, the radiators are all serviceable, and as they set show no ill effect of the freezing. If they had been cast-iron radiators every radiator section in the house would have been broken. We regard this as quite a feather in your cap."

CORRESPONDENCE

Words of Encouragement

Editor HEATING AND VENTILATING MAGAZINE:

I wish to congratulate you on your magazine, as you have succeeded in making it quite an interesting and instructive journal. I hope that it will see many other Five Year anniversaries.

HARRIE D. CRANE.

Cincinnati, June, 1909.

American Exposition in Berlin

An American exposition will be held in Berlin, Germany, during April, May and June, 1910. The enterprise is intended to educate the Europeans, especially the German population, to the importance and excellence of American manufactured products. The well-known Exposition Palace, near the Zoological Gardens, has been secured for the exposition and it is announced that the Hamburg-American and German Lloyd lines have granted a reduction of 20% in the freight charges on exhibits both ways. The address of the American headquarters is Hudson Terminal Buildings, 50 Church street, New York, Max Vieweger, manager. The exposition managers have issued a handsome circular giving full information regarding the forthcoming exposition.

New Book

Mechanics' and Materialmen's Lien Laws of the Southeastern States, including Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Virginia, with the act of Congress of 1905, is a new book by Henry A. Alexander, of the Atlanta bar. The author includes abstracts of the decisions of the State and Federal courts on this subject. The book is published at $6.00 by the Southeastern Publishing Co., Atlanta, Ga.

Heard at the Heating Engineers' Summer Meeting

The summer meeting of the American Society of Heating and Ventilating Engineers provided the opportunity, which was taken advantage of, for discussing the welfare of the organization in general and the approaching election of officers, for which a ballot is sent out in advance of the annual meeting. "It was peculiarly fortunate," said one of the prominent members present "that the society held its summer meeting in Indianapolis this year, as it gave Prof. James D. Hoffman, of the local entertainment committee, an opportunity to serve the society, which he did in an able and efficient manner.

"Prof. Hoffman having previously served the society as its first vice-president, the general impression of the local and western members is that he should be elected to the presidency at the coming annual meeting. We think he is the logical candidate and would handle the affairs of the society in a creditable manner, worthy of its increasing importance and membership."

A New "American" Boiler

The announcement of the manufacture of a new boiler by such an old, reliable house as Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., is an item that is

SECTIONAL VIEW OF NEW AMERICAN BOILER

of interest to everyone in the heating and ventilating trade. This firm announces that they are now in position to make

shipment of their new "American" boiler for steam and hot water. It is made in five series of thirty-one sizes for both steam and hot water.

The accompanying illustration shows a sectional view of the new No. S-266 "American," and in the advertisement of the Pierce, Butler & Pierce Mfg. Co. in this issue is shown an external view of the No. S-326 "American" boiler. The Pierce, Butler & Pierce Mfg. Co. has issued a new catalogue describing this new boiler and will send it to any one interested in having the latest pattern of sectional boiler.

Trade Literature

Zellweger Air Washing and Cooling Fan, made by J. Zellweger & Sons, St. Louis, Mo., is a new interesting device described in a circular issued by the makers. In its construction the filter bed is attached to the blades of the fan which are similar to the Sirocco type, and the sprays are located within the fan wheel. The circulation of the water is maintained by centrifugal action.

Sparks-Eddins System of Vacuum Heating is the title of a catalogue, describing a new automatic system of vacuum heating owned by the Automatic Vacuum Pump Co., St. Louis, Mo. The pump used is designed to pump both the air and the condensed steam from the system. The apparatus is described as the only one that can be applied to old as well as to new one-pipe (with air line) heating systems, even where the old system is not tight. The pump is controlled by the vacuum and operates whenever necessary to keep the system free from cold air. In addition to the catalogue, the company issues a comparative table, giving the results with and without the Sparks-Eddins system, showing a saving with the system of from 30% to 50% in the pounds of coal consumed per 1,000 sq. ft. per day and in the pounds of coal consumed per square foot of radiation per day.

Warm Air for Kelsey Dealers is a new house organ, Vol. 1, No. 1, being dated June, 1909. It is a 12-page publication, 4¾ in. x 7 in., published by the Kelsey Heating Co., Syracuse, N. Y., and the first number includes much interesting reading matter upon the topics of "Reaching Home Builders," "Installation Problems," "Selling Points," "Kelsey Advertising," "The Show Window," "Following Up Prospects," concluding with a readable article on "The Exclusive Agent."

Model Boiler and Radiator is the subject of a handsome new catalogue issued by the Model Heating Co., Philadelphia, in which this well-known type of heater is taken up in detail and described with broken photographic views showing the various details of construction. Special attention is called to the tongue construction of the intermediate sections which is the distinguishing feature of the Model boiler, and to the clinker proof grates, which are triangular in form with three bearing surfaces. Among the views is one showing the economy of space and ease of management made possible through the compactness of the Model type of heater. Dimensions and tappings are given for heaters ranging from 207 to 5,020 sq. ft. steam radiating surface and from 344 to 8,347 sq. ft. water radiating surface. An important section of the catalogue is devoted to the company's full line of radiators while another section describes the Model small water heaters. A special note states that the Model heater is rated on the basis of coal consumed per square foot of grate per hour and the efficiency of the boiler, in acordance with the resolution adopted by the American Society of Heating and Ventilating Engineers. Size 6x9 in. Pp. 24.

Foxboro Recorder for July, 1909, published by the Industrial Instrument Co., Foxboro, Mass., contains illustrated descriptions of the company's line of tachometers for testing, decimal dial electric clocks and secondary clocks; together with gauges for various purposes.

Scientific Ventilation is the title of a newly-issued circular published by the Spaulding & Pryor Co., New York, in which is described a new ozone ventilating device, the invention of Charles G. Armstrong, consulting engineer, New York. The company has lately engaged in the manufacture of these devices on an extensive scale.

Leak-No Metallic Compound, made by the H. W. Johns-Manville Co., New York, is the subject of a new leaflet, showing the application of this compound in repairing leaks in anything made of iron and steel. The illustrations show the compound being applied to radiators, boilers, valves, pump cylinders, etc. The H-O pipe joint cement is also brought to the attention of the trade in the circular.

Two Sides of the Story of the Central Power and Heating Plant, illustrating the advantages, by comparative views, of the J-M sectional pipe conduit over other pipe coverings, is the title of a new circular, published by the H. W. Johns-Manville Co., New York. The circular includes many photographic reproductions of actual installations illustrating the points made and figures are presented regarding three types of underground steam systems on a basis of 500 ft. of 6-in. steam mains, with 3-in. returns, from which a saving is shown in favor of the J-M conduits of 82% over wood covering and 44% over brick or concrete. The company states that over 150,000 ft. of J-M sectional conduits has been installed without one complaint.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes

C. R. Crane, vice-president of Crane Co., Chicago, has been appointed United States minister to China by President Taft.

Societa Nationale Dei Radiatori, Milan, Italy, has been established, bearing the same relations to the American Radiator Co. as the English, German and French companies. Louis B. Reed has been appointed general manager of the company, and Charles F. Hauss has been made sales manager.

Building operations in June show a gain over the corresponding period a year ago. The eastern states reported a decrease of 12%, due to the smaller number of permits filed in New York City. This is attributed to the likelihood that the proposed new building code would be squashed, an anticipation that was realized by Mayor McClellan's recent veto of the code. New York had previously reported an unusually large amount of building operations. The middle western cities showed an increase of 34%; Pacific coast, increase of 24%; southern cities, increase of 33%.

Western Trade Golf Association has reorganized by electing the following officers: President, Paul Blatchford; vice-president, J. W. Watson; secretary, R. B. Flershem; treasurer, D. F. McCabe.

National District Heating Association, formed of central station managers interested in district heating, was organized at Toledo, Ohio, July 15. The new organization will be composed of active and associate members, the latter being drawn from heating supply houses. The following officers were elected: President, A. C. Rogers, Cleveland; vice-president, A. N. Cope, Springfield, O.; secretary-treasurer, W. A. Wolls, Columbus. Executive committee: E. F. G. Gwynn, chairman; membership committee, W. A. Wools, chairman; finance committee, A. N. Cope, chairman; programme committee, D. J. Hard, chairman. The annual dues were fixed at $5.00 for active members and $10.00 for associates. The first annual meeting of the association will be held in Columbus in November

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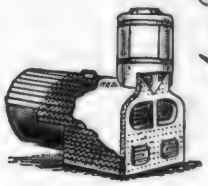

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HEADQUARTERS FOR
85% MAGNESIA, ASBESTOS AND BRINE
PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

100 NORTH MOORE ST, NEW YORK CITY.

next, the dates to be fixed by the executive committee.

Aurora, Ill.—The Western United Gas & Electric Co. has signed contracts for the improvement of its commercial heating system, involving an immediate expenditure of $40,000 and an ultimate expenditure of $100,000. The present system will be greatly enlarged and extended to the island this year and to the west side next year.

Meridian, Miss.—Asserting that the workrooms were not sufficiently ventilated, 50 weavers employed in the Meridian cotton mills walked out recently when the management refused a request that the windows be kept open.

Technical Index, a comprehensive record of current technical literature published in Belgium, announces that hereafter it will be represented in the United States by the Geo. H. Gibson Co., Tribune Bldg., New York City. The Technical Index appears monthly and gives a systematic descriptive record of all original articles appearing in over 200 engineering and technical journals and reviews, also indexing the proceedings of technical societies and technical books issued in all countries. The American agents offer to send free sample copies upon request and will also receive orders and subscriptions.

Trade Literature

Kelsey Gravity and Mechanical Systems for heating and ventilating are installed in buildings of every description, including churches, hospitals, schools and residences, as shown in a new circular issued by the Kelsey Heating Co., Syracuse, N. Y., illustrating the wide variety of conditions to which the Kelsey system is adapted. Size 4 x 9 in. Pp. 12. Another catalogue of the same page size describes and illustrates at length the Kelsey warm-air generating system, with many broken views showing the air travel through the "Zig Zag" air tubes, which are the distinctive feature of these generators. A special series of views show the Kelsey system as applied to fan blast plants. Pp. 32.

"Detroit" Trap Systems, made by the American Blower Co., Detroit, Mich., are called to the attention of the trade in a card showing the device connected for boiler feed, water lift and coil drainage purposes.

Graphite for June, 1909, published by the Joseph Dixon Crucible Co., Jersey City, N. J., contains much of interest on the various uses of the Dixon graphite products. The thirteenth of a series of articles by W. H. Wakeman on the "Prevention of Corrosion of Steam Machinery" takes up the locomotive type of tubular boiler, calling attention to the troubles that are most likely to arise through corrosion in the operation of this type of boiler.

Why Not Make Your Own Light and Save 25% on Your Investment? is an interesting 4-page folder, published by the American Blower Co., Detroit, Mich., showing a comparison of the isolated lighting plant with central station service, the figures being decidedly in favor of the isolated lighting plant.

The Marvel Thermostat, made by the American Thermostat Co., Elmira, N. Y., is the subject of a newly issued catalogue describing and illustrating this useful device, which is a mechanical thermometer operating a motor in the basement controlling the drafts of heating apparatus. The device is described in detail, with views showing its operation under varying conditions. Size 4½ x7¼ in. Op. 24.

Did the Doctor Tell You? and **Nye Tools** are two typical "Nye" circulars, sent out by the Nye Tool and Machine Works, Chicago, describing the Nye pipe threading tools, the latter containing price lists and details of construction which form a handy reference of the company's line of die stocks, pipe vises, spud wrenches and combination sets.

"Standard Steam Pipe Casing and Wooden Water Pipe are the subjects of a new catalogue, Bulletin No. 113, issued by the American District Steam Co., Lockport, N. Y. The insulation of underground heating mains is a branch of engineering in which this company has had wide experience which is placed at the disposal of those interested in exhaustive statements as to the why of the present methods of manufacture as well as the results that have been obtained under various conditions. The illustrations include a half-tone view of the company's new plant for the manufacture of pipe casing, replacing the buildings recently destroyed by fire; also, il-

DIXON'S PIPE - JOINT COMPOUND

for all threaded or flanged connections. Makes tight joints, but never sets. Write for booklet and free sample 211 - D

JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY, N. J.

lustrations of the pipe casing and a cross section of an insulated steam main, showing the under drainage. A price list with general information is also given, covering pipes from 1 in. to 20 in. in diameter. Size 6x9 in. (standard). Pp. 10.

Simplex Condensation Meter and Steam Pressure Meters, made by the American District Steam Co., Lockport, N. Y., are described in Bulletin No. 114, just issued. "The meter method," says the circular, "of charging for various public utilities, such as water, gas and electric light, have become universal." Many photographic views, with details of all the parts of the Simplex device, are numbered among the illustrations, showing how the apparatus measures the amount of steam used by a consumer in buildings heated from a central plant by accurately weighing the water of condensation. The Holly steam meter is also shown, being designed to operate upon the velocity principle and built for pressures from 5 to 60 lbs. Other devices illustrated are the St. John meter, which measures the quantity of steam flowing through it at all pressures and under varying loads, and the Sargent meter, indicating the pounds of steam flowing through it irrespective of the pressure. The tables included contain sizes, capacities, list prices, etc. of each device. Size 6x9 in. (Standard.) Pp. 24.

Pressed Radiator Company of America has issued a new catalogue in which the details of construction of the Kinnear pressed radiators are shown in a series of photographic views, to which are added cut open sections of the different models made by the company, illustrating the double inter-locking seam and malleable connections. These models now include the Heela 2-col., the Eureka 3-col. and the Beaver 1-col., all for steam or water, floor or wall; also the Duquesne 1-col. wall radiator. Tables included in the catalogue contain lists of heating surfaces and list prices per square foot for radiators containing from 3 to 35 sections. There are also a number of special radiator designs such as the Heela 2-col. direct-indirect steam or water ventilating radiator, with box base, the Eureka indirect radiator for steam or water, the Kinnear radiator shield, and legs, wall and ceiling brackets. Size 5½x8¾ in. Pp. 24.

Stucco Suggestions is the title of a folder published by the H. W. Johns-Manville Co., New York, showing examples of the superior results obtained by the use of J-M Asbestic stucco. Asbestic is a pure ground asbestos rock, which, in combination with Portland cement, constitutes this interesting product. It is applied by first covering the sheathing boards with a layer of Keystone hair insulator, over which is nailed galvanized wire lath, to which the Asbestic stucco is applied. A sample specification, which accompanies the folder, gives full information as to the necessary form to be used, as well as directions for mixing.

National Ventilating Fans, including direct and alternating current and pulley drive, are described in Bulletin No. 50, of the National Blower Works, Milwaukee, Wis., illustrating the company's new line of exhaust fans of the Blackman type, with capacity table and price lists. Size 3¼x6¼ in. Pp. 8.

Steam Circulation is an interesting booklet on this subject, with special reference to the Positive Differential System just published by the Differential System Co., New York, of which James A. Donnelly is president and general

It Saves Coal

The Gorton Quick Opening Steam Radiator Valve

One third of a turn of the lever handle will open or close the valve

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manager. As its name indicates, the principle on which these particular appliances operate makes the system essentially a difference in pressure system. To obtain this difference, a vacuum may or may not be carried upon the entire apparatus, or upon the return or air lines. The company, it will be recalled, was recently incorporated to take over the business and sales of the Positive Differential system and the Gorton system, both being covered by the same patents and operating upon the same principle. In addition to a detailed description of the Positive Differential system, the catalogue contains much convenient data for estimating the amount of radiation required, and sizes of steam mains, the latter subject including Mr. Donnelly's well-known table of steam main sizes for velocities running from 10 to 130 ft. per second and for 100 ft. runs with 1 oz. drop. The catalogue is fully illustrated and list prices and capacities are given for the various specialties used in the system, which are sold outright, with no royalty charges. Sizes 6x9 in. (Standard.) Pp. 24.

Manufacturers' Notes

C. A. Dunham Co., Marshalltown, Ia., will erect a $35,000 plant to manufacture hot water heaters.

Crane Co., Chicago, formally took over the business of Knight & Jillson Co., Indianapolis, July 1. Claude McElwaine has been appointed manager of the Indianapolis branch.

Columbus Heating & Ventilating Co., Columbus, O., has increased its capital stock from $40,000 to $200,000, for the purpose of enlarging its factory, and to take care of its increased business.

Utica Heater Co., Utica, N. Y., is adding a line of heating specialties to its output of heating boilers.

John T. Young Boiler Co., Norwich, Conn., has commenced the manufacture of a line of radiators, to be known as the Norwich line, supplementing its line of Norwich boilers.

Geo. F. Hughson Co., First National Bank Building, Chicago, has been appointed western representative of the A. M. Byers Co., Pittsburg.

Pratt & Cady Co., Hartford, Conn., and the Chapman Valve Mfg. Co., Indian Orchard, Mass., it is reported, are planning to consolidate. Adolph W. Gilbert, president of the Pratt & Cady Co., has resigned to become president of the Chapman Valve Mfg. Co. The two companies are engaged in the manufacture of similar lines of brass and iron valves, hydrants, etc. The Chapman Valve Co. is now capitalized at $1,000,000 and Pratt & Cady has a capital stock of $400,000.

Central Tube Co., Pittsburg, Pa., will have its works at Economy, Pa., ready for operation, it is expected, early in September. Walter F. Ingals, formerly with the National Tube Co., has been appointed manager of sales. Olin, Giberson & Hilands, 2 Rector street, New York, have been appointed eastern representatives.

McCrum-Howell Co., New York, has built in its new quarters at Park avenue and 41st street, a cross-section of a two-story house, equipped with the proper heating and plumbing apparatus, which are shown in operation. The display is in charge of E. E. Fox.

International Steam Pump Co., New York, reports a decrease in manufactur-

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Lockport, N. Y. N. Tonawanda, N. Y. Chicago

ing and trading profits for the year ending March 31, 1909, of $322,323.

XXth Century Heating and Ventilating Co., Akron, O., will increase its capital stock from $100,000 to $350,000 to take care of its rapidly increasing business.

B. F. Sturtevant Co., Hyde Park, Mass., with a capital of $500,000, has been reorganized and recapitalized at $1,250,000, 6% cumulative preferred stock and $1,250,000 of common stock, all of which has been taken by the present stockholders. The officers are: President, John Carr, chairman of the board of directors of the First National Bank, Boston; treasurer, Eugene N. Foss; general manager, E. B. Freeman. The reorganization will affect no material change in the business of the company, the increased capitalization being represented in the construction of the new $1,500,000 plant at Hyde Park, recently completed, and in other contemplated enlargements.

Standard Steam Specialty Co., New York, announces the election of Norman C. Brizse as president, succeeding the late E. H. Roberts, who died recently. Mr. Brizse has had an extensive steam engineering experience, both with this company and with the Babcock & Wilcox Co., with which he was formerly connected. Percy A. Pinder has been elected secretary and treasurer of the company. Mr. Pinder has been connected with the Standard Steam Specialty Co. since its incorporation and was instrumental with Mr. Roberts in bringing the "Utility" specialties, made by the company, to their present successful position in the power-plant field. The main office of the company will be continued at 542 West Broadway, New York, and branch offices will be established in some of the other large cities.

New Incorporations

Sewickley Light, Heat & Power Co., Sewickley, Pa. Capital stock, $5,000.

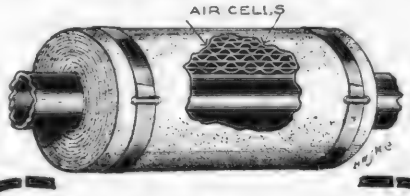
Johnson & Davis Plumbing & Heating Co., Denver, Colo., capital, $10,000. The principals are James J. Johnson, A. J. Davis and M. W. Weber.

Kenney Specialty Co., New York, organized by A. E. Kenney and A. R. Vail to manufacture the Flush-Voir flushing valve and to deal in other plumbing fixtures.

Hurst Bros. Co., Syracuse, N. Y., capital, $15,000, to carry on a steam heating, electric wiring and plumbing business. Incorporators: C. T. Hurst, Charles T. Hurst, and L. A. Hurst, all of that city.

New Firms and Business Changes

Union Plumbing Co., Glens Falls, N. Y., has been incorporated to take over the heating and plumbing business of



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Insulation is based on the fact that heat cannot pass through dead or *motionless* air. Ordinary air cell coverings used for heating work confine *live* air and *not motionless* air—they have large air spaces running from end to end which allow air to travel back and forth. Therefore, they do not prevent the loss of any great amount of heat any more than you could keep heat from escaping from a pipe or a radiator in a room by closing all the doors, windows and vents.

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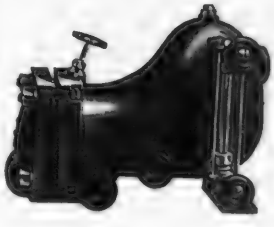

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Norcross Bros. of that place. President, S. R. Washburn; secretary and treasurer, J. F. Leeds; vice-president and general manager, E. B. McKey.

Business Chances

Milwaukee, Wis.—A $17,000 boiler house and heating plant will be built at the Stevens Point institution this fall and an $18,000 boiler house at Oshkosh.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following named work:

Until August 30, 1909, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post-Office at Paris, Ky.

Until September 7, 1909, for the mechanical equipment (excepting elevators) including plumbing, gas fitting, boiler plant, heating and ventilating system, electric generating system, conduit and wiring system, vacuum cleaning system and clock system for the U. S. Post-Office and Court House building at New Orleans, La.

Business Troubles

Hopkins-Jordan Co., New York, contractors for steam heating apparatus at 148 West 24th street, has made an assignment to Maxwell Hall-Elliott.

Salt Lake Public Service Co., Salt Lake, Utah, is in the hands of a receiver and President J. J. Chambers has announced that the affairs of the company will be wound up. It is also stated that plans to finance the company were frustrated by E. H. Harriman, as the project promised competition for the Utah Light & Railway Co., which is his personal property.

Contracts Awarded

Roekel Plumbing & Electrical Co., Zanesville, O., steam heating, plumbing and water works for the Morgan County Infirmary at McConnelsville.

James Rowson, Des Moines, Ia., boiler house and steam heating plant for the court house at Newton for $15,000.

J. M. Abbott & Co., Seattle, Wash., new heating plant and other improvements at the Lincoln School at Bellingham, for $9,500.

Evans, Almirall & Co., New York and Chicago, heating 54 buildings to be erected at Fort Sill, Okla. for $100,000. The plumbing contract was awarded to the Newport Plumbing, Heating & Tinning Co., of Newport News, Va., at its bid of $47,000. The government will also erect a power house to cost $100,000.

Springfield Plumbing Co., Springfield, Mo., construction of central heating plant for local schools to cost $18,496.

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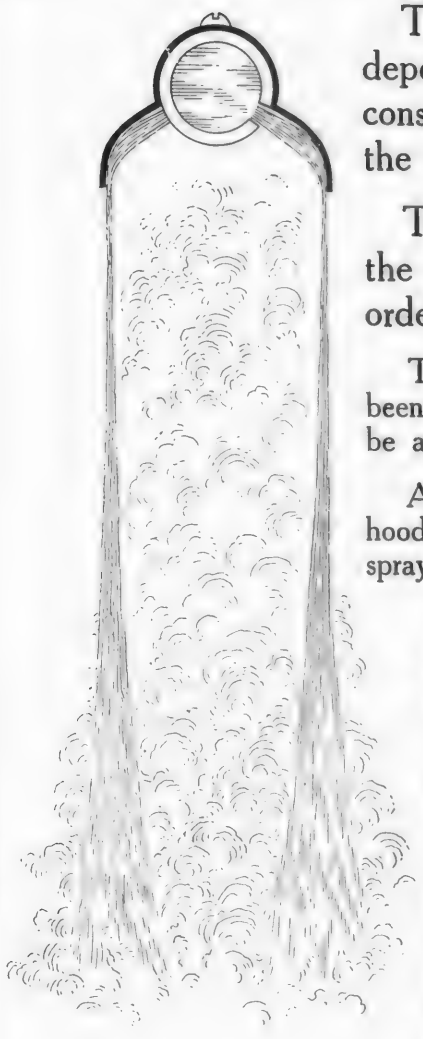

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A perforated brass pipe and a copper hood extending across the ceiling of the spray chamber—that's all.

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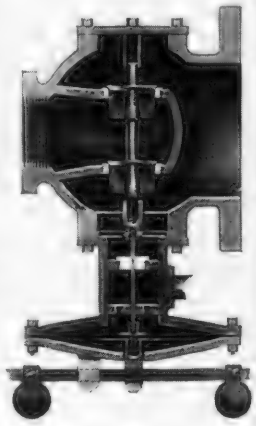

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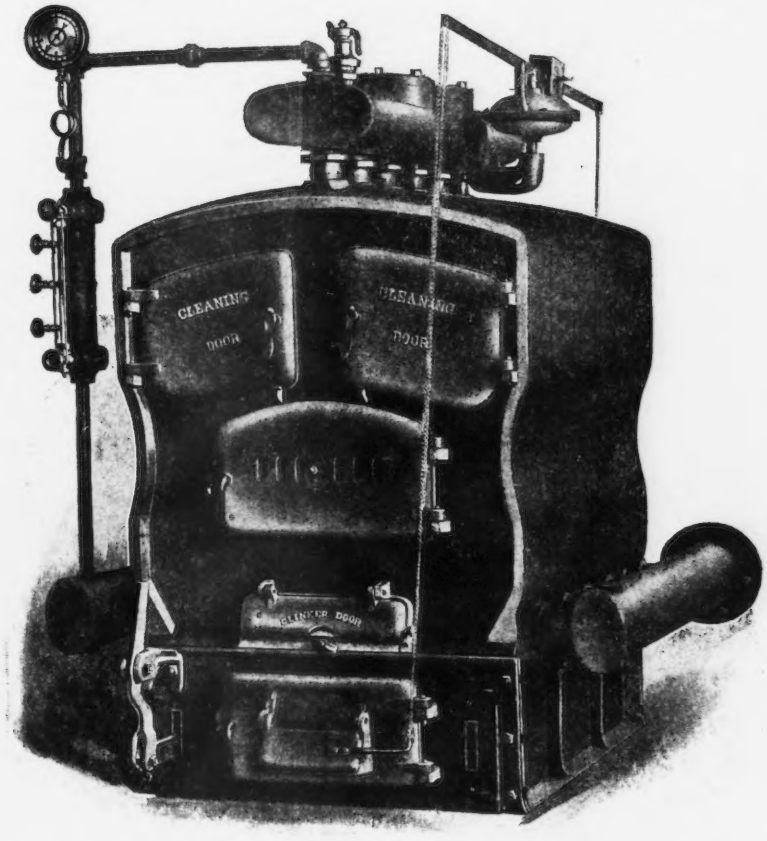

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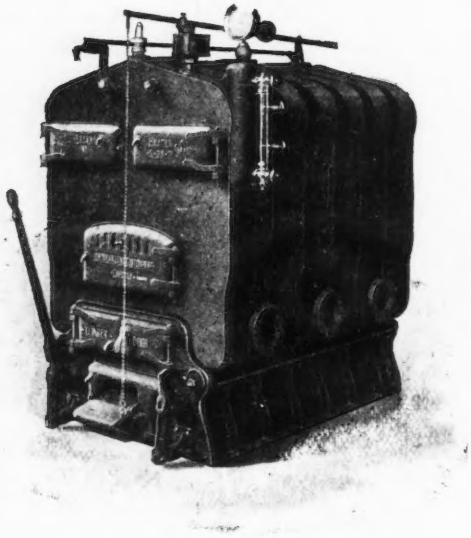

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